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General Articles

CANINE NUTRITIONAL DEFICIENCY DISEASES*

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THE ECONOMIC importance of the dog to-day surpasses the status of this animal at any time in the history of mankind. There has been a steady rise in the popularity of dogs since the World War, with a reported 1,800,000 dogs registered with the American Kennel Club and similar dog fancy organizations. This, of course, does not take into account the estimated 15 million crossbred and pedigreed dogs in the United States and Canada. One fourth, or 3,750,000, of them are the pedigreed and purebred but not registered class of dogs. Leon F. Whitney, D.V.M., in an article published recently in the American Kennel Gazette, stated that the farm-dog population is at least 7 million. In his estimation of the economic importance of dogs, as regards their food consumption, he stated that it requires 37,305,000 acres of land to produce their food. This area is equivalent to the acreage of the entire New England States, plus Pennsylvania, New Jersey, Delaware and Maryland. Whether or not this estimate is correct, we are not in a position to say, but we do know that with the increase in the dog population the demand for prepared foods has shown a decided increase.

From the Research Laboratory of Swift & Company.

*Journal of the A.V.M.A., April 1941.

According to investigators, a great many dogs require treatment for ills which are primarily of dietetic origin. There may be several reasons for such an opinion, prominent among them being:

(1) Increased care and attention being given the dog by the average owner.

(2) The greatest percentage increase in dog ownership has occurred in metropolitan districts where the animal leads a restricted life, both from a standpoint of exercise and diet.

(3) A majority of the brands of canned dog foods claim to have a completely balanced diet, a statement which is open to doubt in a large number of cases. Dogs fed exclusively on an inferior product are almost certain to become ill with many symptoms of deficiency.

As to the volume of prepared dog foods, we can state that the sale of canned and dried dog foods has either followed or led this increased desire for dogs in the home. There are at present approximately 600 brands of dog food offered for retail sale, prepared by over 250 manufacturers. The 1939 total volume was, in round figures, 600 million lb. The volume of the canned product was second only to milk, which ranks first.

We are well aware that there are on the market a number of canned dog foods, as well as dry ones, which are the result of honest, scientific efforts to make a nutritionally adequate and wholesome product. Unfortunately, we also know some brands are being marketed that are of inferior nutritive quality. The dog and its nutritive requirements, the expectancy of the owner to obtain full value for his money, and the hope of the veterinarian that he can recommend a dog food to his clients with confidence, are all points which should be given due consideration by manufacturers. It would seem of paramount importance, therefore, that some accurate, fast and economical method be devised to appraise the nutritive value of all dog foods.

Dietary Requirements.

Most of the information available on the dietary requirements of the dog has been compiled from a large number of experiments in which the dog was merely a test animal. Unfortunately, there have been relatively few studies made on the requirements of the dog itself. Prominent among the investigators who have used the dog as an experimental animal and from whose work we may draw conclusions are Ivy of the North-western University Medical School; Cowgill of Yale; Steenbock and associates of Wisconsin; Elvehjem and co-workers of Wisconsin; Mellanby of England; and Schlotthauer of The Mayo Foundation, to mention only a few. Discussing the various nutrients individually we mention the following:

(1) *Protein*.—The nutritive value of any protein material is dependent directly upon the amino acids it can supply. There are ten or more essential amino acids which must be present in the dog's diet to permit proper growth (muscular, glandular, general tissue, and hormone formation; and replacement). In general, the proteins of animal origin are far superior to those found in cereals or vegetables. Mixtures of proteins from vegetable and cereal sources are appreciably improved by the addition of meat proteins. In general, one may say that dog foods containing 10 per cent of protein, which is primarily of animal origin (usually not less than 75 per cent of animal origin), will give excellent growth, provided the other essential nutrients are present. It has been found by biological experimentation that those dog foods containing less than 10 per cent of protein are liable to be deficient.

From the above statement on the place of proteins in the diet, we feel that it would be presumptuous to point out the deficiencies that can arise from the use of a diet which is low in proteins of high biological value. We deem it appropriate, however, to call attention to the work of Agnes Fay Morgan of California and Elvehjem and coworkers of Wisconsin, who have held that fright disease was due to a deficiency of one of the essential amino acids, lysine. Elvehjem *et al* reported before the American Chemical Society meeting at Detroit, in September 1940, that on tests they had run on baked dry dog foods nervous and paralytic symptoms of the test animals had developed as well as an unsatisfactory growth. This they attributed primarily to a deficiency of lysine, which is not heat-stable in dough mixtures.

(2) *Fat and Carbohydrates*.—That dogs are able to almost completely digest starch has been demonstrated by Ivy of the North-western University Medical School. The main objection to canine rations high in carbohydrates is that this substance displaces proteins, minerals and vitamins and thus acts to decrease the percentage of these factors in the diet. It is probably safe to say that a nutritive ratio of two parts of carbohydrates and fat to one part of protein should be the maximum limit in a dog's ration. The requirement or tolerance for fat will depend a great deal, of course, upon the energy requirement of the individual animal. It has been suggested that a range of a maximum of 5 per cent and a minimum of 2 per cent fat in a canned dog food is probably best suited for all types of dogs. The nutritive value of proteins, carbohydrates and fat is not appreciably impaired by canning processes.

(3) *Energy Requirements*.—The deficiencies due to an inadequacy of carbohydrates and fat are readily apparent from the following discussion of their function and requirements. During the periods of puppy growth,

pregnancy and lactation, dogs require more than the maintenance allowance of food. It has been indicated that puppies may require about twice the predicated maintenance levels on calcric intake for adult animals. The accepted standard on caloric requirements for a dog from a maintenance stand-point, as determined by Cowgill has been 70 to 80 calories per kilogram of body weight per day. This means approximately 30 to 40 calories per pound per day, varying widely according to the stage of development, weight and working conditions.

If a dog food meets the minimum standard of 10 per cent protein, 2 per cent fat and a nutritive ration not greater than 2 to 1, the range of canned food intake per dog per day will be about from 1 lb. for a 15-lb. dog to 2½ lb. for a 50-lb. dog, with increased food intakes for unusual functions. It must be remembered that the most satisfactory way of supplying elements for the maintenance of body heat and supplying energy is by the supplying of an adequate amount of carbohydrate and fat, and not by the wasteful and excessive use of proteins.

(4) *Minerals* :—The requirements of dogs for the mineral elements have not been sufficiently studied to permit accurate estimations. Some idea of



Fig. 1. Avitaminosis A. Advanced stage of ophthalmia in a dog kept on a vitamin A-deficient diet for 84 days. Almost complete collapse made it necessary to support the head for this picture.

(Photo courtesy American Journal of Physiology and of A.V.M.A..)

the requirements may be obtained of course, from general figures for other animals' requirements. Calcium and phosphorus, which are so essential both

in amount and in balance to the formation of strong bones and sound teeth, are completely available to the dog when supplied as bone ash or ground bone. Most rickets in the dog has been found to be of the type caused by a combination of vitamin and mineral-deficiency factors. This constitutes another argument for a relatively high meat content in dog foods, since these products are rich sources of essential minerals and vitamins. This does not, however, mean that mineral supplementation as well as vitamin supplementation to most dog diets is not necessary. Other essential minerals such as iron, copper, iodine, magnisium and sulphur, are ordinarily considered to be furnished in adequate amounts by the natural plant and animal products which are used in the better classes of prepared dog foods and home-prepared diets. Common salt will, of course, supply the necessary sodium and chlorine. Additional information relative to mineral and deficiency diseases will be given in a later paragraph in this paper in the discussion of vitamin D.

5. *Vitamins*.—The vitamin requirements of the dog have been studied in detail by Cowgill of Yale, who used this animal in his original work on vitamin B₁. Other investigators have used the dog for studies on vitamin D in relation to the deficiency disease, rickets, and vitamin A in relation to muscular weakness and the eye deficiency disease of xerophthalmia. The vitamin C requirement of the dog has been closely studied and it has been found that this animal is able to synthesize the vitamin.

It might be well to state here that the question of vitamins is not related to the individual vitamin materials but, rather, to the function of all of these materials in proper balance and combination. A deficiency of one vitamin may cause an improper metabolic use of all the other vitamins which are known to be essential. Such a statement is, of course, true of any balanced diet. There are always certain limits above the minimum requirements which will not upset the balance of a ration, but should any one of the essential nutrients, including minerals and vitamins, be out of balance from the standpoint of deficiency, there will be a corresponding unfavourable reaction from all the other food materials.

Tremendous strides are being made daily in the isolation and identification of the many vitamins concerned in human and animal nutrition. One of the most important recent findings is the identification of the canine anti-blacktongue and human anti-pellagra vitamin. This has been found to be a relatively simple chemical compound—nicotinic acid. The discovery was made by Elvehjem and co-workers of the University of Wisconsin. Sebrell of the U. S. Public Health Service, Cowgill of Yale and several others have verified the findings that nicotinic acid is the specific material concerned in the prevention and cure of canine black-tongue.

Concerning all nutritional research to the present time, we may outline the known vitamins and their functions in canine metabolism together with



Fig. 2. Same subject as in figure 1 after having been treated for ten days with 20 cc. of cod liver oil per day. Note almost complete disappearance of the ophthalmia.

(Photo courtesy American Journal of Physiology and of A.V.M.A.)

a description of them, including their deficiency symptoms, and other pertinent information as follows :

Vitamin A

Generally recognized chemical formula $C_{20}H_{30}O$. Commonly designated as the antixerophthalmic vitamin. No chemical name has yet been officially adopted.

Description.—Soluble in oils, not in water, not affected by heat in cooking or drying, but inactivated by oxygen at higher temperature.

Functions.—Promotes growth, appetite and digestion. Essential for normal reproduction, lactation and rearing of the young. Protects against xerophthalmia, night blindness and against infections of the respiratory tract. Estimated requirement for dogs : 70 to 80 international units per kilogram of body weight per day.

Deficiency Symptoms.—(a) Incipient stage. Lowered resistance to infections. inflammation of intestines and slight inflammation of the upper respiratory passages, Retarded growth or loss of weight.

(b) Advanced stage. Impaired vision, particularly night blindness. Inflammation of the conjunctiva even advancing to ulceration of the cornea. Injury to mucous linings of the body.

Sources.—Fish liver oils, liver, green vegetables, kidneys, butter, hearts, tomatoes, carrots, cheese, eggs and milk.

Vitamin B₁

Generally recognized chemical formula $C_{12}H_{13}N_4OSCl_2$. Usually termed the anti-neuritic vitamin. Chemical name in the pure state, thiamin chloride.

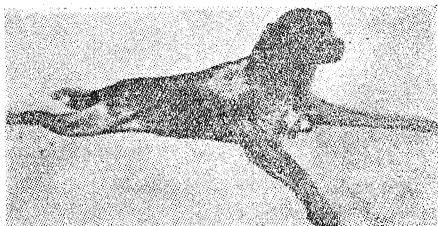


Fig. 3. Vitamin B₁ deficiency showing extensive polyneuritis. The leg muscles were contracted, especially those of the posterior extremities resulting to extension of all limbs and inability to stand. When this dog was handled, severe clonic spasms resulted.

(Photo courtesy American Journal of Physiology and of A.V.M.A.)

Description.—Soluble in water and not in oils. Partially destroyed by heat particularly in the presence of alkali and oxygen. It is available synthetically.

Functions.—Promotes growth, appetite, carbohydrate utilization and digestion. Protects against the nerve disease, polyneuritis. Required for normal reproduction and lactation. Estimated canine requirement 3 to 4 international units per pound of body weight per day for mature dogs, and up to three times this amount for the period of rapid growth.

Deficiency Symptoms.—(a) Incipient stage. Poor growth of young during lactation, decreased fertility, inappetence and retarded growth or loss of weight.

(b) Advanced stage. Polyneuritis characterized by paralysis and nerve degeneration, cardiac weakness and edema. Patton has reported that fright disease of dog due to a deficiency of this vitamin. This report is questioned by several investigators because they have not been able to reproduce his findings as reported.

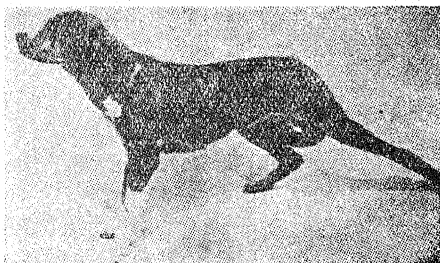
Sources.—In the pure state as thiamin chloride. Also from rice polish, dried yeast, liver, lean pork, wheat germ, milk, beef, eggs, carrots, tomatoes, whole wheat and citrus juices.

Riboflavin

The generally recognized chemical formula is $C_{17}H_{20}M_4O_6$.

Description.—Soluble in oils, stable to heat.

Fig. 4. Same subject as in figure 3, 18 hours after the administration of neutralized tomato juice. Spasticity of the muscles and spasmodic condition almost gone.



(Photo courtesy American Journal of Physiology and of A.V.M.A.)

Functions.—Essential for growth and in maintaining a healthy condition of the skin. Estimated canine quantitative requirement 25 micrograms per kilogram of body weight per day.

Fig. 5. Vitamin D-deficiency. This dog grew from puppyhood on a vitamin D-deficient diet which resulted in this extreme case of rickets.

(Photo courtesy American Journal of Physiology and of A.V.M.A.)



Deficiency Symptoms.—(a) Incipient stage. Inconstant dermatitis consisting of erythema followed by dry, flaky exfoliation. In males the scrotum has been involved otherwise most common on the chest, abdomen, insides of the thighs and axillae.

(b) Advanced stage. Bradycardia and an exaggerated sinus type of cardiac arrhythmia. Premature aging. In the final stages, the respiration is slow and irregular, finally terminating in collapse, coma and death. Necropsy findings center around a yellow mottling of the liver with a high fat content.

Sources.—Concentrates from liver, yeast and whey. Also from kidneys, liver, milk, lean beef, eggs, greens, soya flour, various fruits and vegetables.

Nicotinic Acid

The usual quoted chemical formula is $C_6H_5NO_2$. The accepted descriptive name is anti-black tongue or anti-pellagra vitamin.

Description.—Soluble in water, stable to heat.

Functions.—Necessary for the prevention or cure of canine blacktongue. Estimated dog requirement as protective for blacktongue 0.2 mg. per kilogram of body weight per day and curative 0.5 mg. per kilogram of body weight per day. Administered either orally or intramuscularly. Nicotinic acid amide is reported to have the same effect.

Deficiency Symptoms.—(a) Incipient stage. Poor appetite, progressive weight loss.

(b) Advanced stage. Vermillion bands on lips, general reddening of the oral mucosa and occasionally persistent diarrhoea. This is particularly true in the marked

deficiencies as well as the well-known extensive lesions of all oral tissue accompanied by a characteristic fetid odor.

Sources. In the pure state as nicotinic acid. Also from liver, yeast, meat, wheat-germ, tomatoes, beans, eggs, milk and soya flour.

Vitamin B₆

This has been termed by some investigators as pyridoxine. It is one of the newest members of the B. complex and was isolated in 1938 and synthesized for the first time in 1939 by Folkers and Harris of the Merck Research Laboratory.

Unna, in his paper prepared for the A.V.M.A. meeting in Memphis, 1939, stated : Vitamin B₆ is needed by rats and dogs for normal growth and development and there is a strong indication that it is also required by the pig and man. White rats on a diet complete in vitamin B₁, nicotinic acid and riboflavin (and other factors recognized as the B complex) but deficient in B₆, cease to gain weight after three to six weeks and develop characteristic skin lesions of so-called rat acrodynia. The paws become swollen, edematous and denuded. Ulcers frequently develop around the snout and on the tongue. The ears thicken and become scaly. The animals lose weight and die within one to three weeks after symptoms develop. Administration of vitamin B₆ relieves the symptoms promptly and the rats gain weight. Natural food sources of this vitamin are lever, yeast and rice bran."

Vitamin C

The usually recognized formula is $C_6H_8O_7$. It has been designated as the anti-scorbutic vitamin. Chemical name is ascorbic acid.

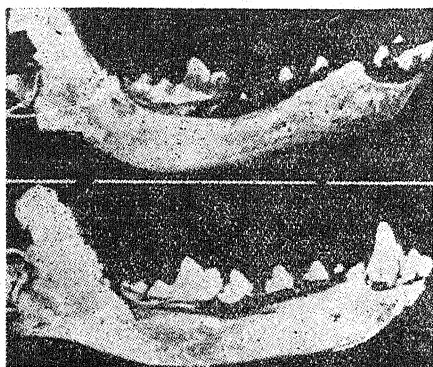


Fig. 6. Vitamin D-deficiency. The jaw bone shown in the upper picture was taken from a dog raised from puppyhood on a vitamin D-deficient diet. The jaw bone shown in the lower picture is normal, the dog from which it was taken having always had an adequacy of vitamin D.

(Photo courtesy American Journal of Physiology and of A.V.M.A.)

Description. Water soluble. Destroyed by oxidation at high temperatures.

Functions. Essential for normal bone and tooth formation. It is necessary in the oxidation processes of the cells. The normal dog can synthesize vitamin C.

Vitamin D

Commonly termed the anti-rachitic or "sunshine" vitamin. The usually recognized chemical formula is $C_{27}H_{44}O$. No chemical name has been adopted, officially,

nor has this vitamin yet been synthesized. Quite a few workers prefer to split this vitamin up into several divisions, giving them numbers as vitamin D₂, D₃ etc.

Description. Soluble in oil; stable to heat and oxidation. Occurs in several forms.

Functions.—Regulates the absorption and metabolism of calcium and phosphorus for the bones and teeth. Prevents rickets. Canine requirement is the subject of considerable controversy. It has quite generally been stated that 1.5 to 2 international units per kilogram of body weight per day per mature dogs and 20 to 25 international units per kilogram of body weight per day for the period of rapid growth was adequate, but a great deal of research tends to cast suspicion on these figures. The smaller dogs, particularly terriers of all kinds and some of the spaniels, may require far less vitamin D for normal bone calcification than do some larger breeds. Some of the larger breeds, especially the Danes, may require many times that of the smaller breed on a kilogram per body weight basis. The vitamin D requirement varies quite widely with the amount and ratio of calcium and phosphorus in the diet and conditions under which the pup is raised as well as the breed.

Deficiency symptoms.—(a) Incipient stage. Increased tendency for dental caries. Lowered resistance.

(b) Advanced stage. Rickets and Osteomalacia.

Sources.—Sunshine, fish liver oils, irradiated ergosterol, and egg yolks.

Vitamin E

The usual designated chemical formula is C₂₀ H₃₀ O₂. It is termed the anti-sterility vitamin. Sometimes called by the chemical name of tocopherol.

Description.—Oil soluble, extremely stable, inactivated by oxidation.

Functions.—The ordinary balanced ration apparently carries enough vitamin E for normal reproductive processes in the dog. The quantitative canine requirement is not known.

It has been reported by some workers that a deficiency of this vitamin in a dog has been responsible for abortion in the female and also resorption of the fetus. Loss of fertilizing power and libido in the male have also been attributed to a deficiency of the vitamin. The work we have reviewed does not appear to be conclusive in this respect.

Sources.—Wheat germ oil and wheat germ meal. Whole grain cereals and vegetable and corn oils.

Other Vitamins

There are several other factors which are recognized as being vitamins but whose functions are not yet established to the point of practical interest. Among these may be mentioned pantothenic acid, which Elvehjem and coworkers claim to have definitely shown to be required by newly weaned puppies and older growing dogs for normal growth. They report that the complicated nature of pantothenic acid deficiency, such as they have observed thus far, reduces the significance of the variety of symptoms which they have seen. Irregular cardiac activity in tachycardia, less frequency in

bradycardia, nausea and vomiting, intussusception and finally loss of fur and dry scaliness of the skin suggest an impairment of autonomic control and especially that of the parasympathetic nervous system. What factor or factors these symptoms are attributable to cannot be seen in the light of present evidence. Then, too, there is a factor W, the gray hair factor, B₆, B₁, B₃, the anti-hemorrhagic vitamin K and possibly others that we might consume your time in discussing; but in as much as the function of these factors in canine nutrition and the requirements for them are not known, we merely list them at this time.

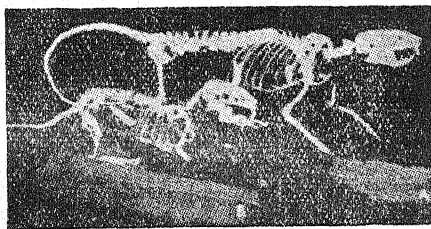


Fig. 7. Calcium and phosphorus inadequacy and improper balance in the rat. A and B are twin brothers. Rat A was raised on a diet adequate in all minerals and in proper balance. Rat B was raised on a diet inadequate in calcium and phosphorus and the balance was incorrect.

Photo courtesy H. C. Sherman. A.V.M.A.

Conclusions

In any consideration of the vitamin requirements and functions for dogs, it must be borne in mind that a deficiency of any one factor has a direct bearing on the functions of many of the other vitamins. A well-balanced ration of natural food products containing adequate amounts of all the known vitamins supplemented with quality oils for vitamin A and D fortification is the most satisfactory method of deficiency prevention. There may be cases in which an impaired absorption in the animal organism can cause vitamin deficiency diseases on ordinary adequate diets. In cases of this kind, or in those in which an immediate response is essential, it is quite possible to take recourse to injection and oral feeding of the several pure vitamins now available.

SOME DISEASES OF THE EAR OF DOGS *

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This Discussion will be confined principally to diseases or conditions external to the ear drum.

Otorrhea is one of the terms used to designate an inflammation of the ear. Clinically we recognize three or four types of otorrhea of the external ear. They are the catarrhal, the parasitic, the chronic indurative and that type, otorrhea cerumenosa, which is due to excess formation of wax. Any one of these types may blend into another. A case of parasitic otorrhea may progress to catarrhal otorrhea with ulcers of the cartilage and even inflammation of the middle and inner ear. In addition to those conditions we are confronted with wounds, tumours of the lining of the external ear, haematomes of the external ear flap and various skin diseases, such as ring-worm and the manges.

Parasitic Otorrhea

Parasitic otorrhea is an inflammation of the lining of the external ear due to the presence and activity of a mange mite. The disease has been called chorioptic otacariasis, auricular scabies, parasitic otitis, epileptiform disease of sporting dogs, and canker. The parasite causing the trouble has had a number of names, among them *Sarcoptes ecaudatus*, *Symbiotes auricularis*, *Choriptes auricularis*, *Dermatophagus auricularis* and *Otodectes cynotis*. It does not burrow in the skin as does the sarcoptic mite, but supposedly pierces the skin to suck lymph and so produces an inflammation (Monnig). The irritation produced is probably mechanical from the moving about of the parasites, although a certain amount of infection of the ear lining usually accompanies this condition.

Symptoms. — Intense itching is the most prominent symptom. It results in scratching of the ear with the feet, rubbing the ear on the floor or ground and frequently quite vigorous shaking of the head. The shaking of the head often becomes violent and is especially noticeable when the dog starts to move about after being at rest for some time. Manipulation of the ear also induces shaking.

The itching induced by this parasite may bring an epileptiform convulsions, especially in the young. This fact has been impressed upon us so

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frequently that we always examine the ear of dogs and cats that are presented to us because of convulsions. The vigorous shaking many times results in hematoma of the ear flap or in sores on the end of the ear. These sores on the end of the ear are practically impossible to heal if parasitic otorrhea exists and it cannot be controlled. The most important part of the treatment of these sores is the removal of the cause of the shaking.

Diagnosis.— We make the diagnosis of parasitic otorrhea if we find the parasite. Failing to find the parasite, we also make this diagnosis if we find a chocolate-brown, waxy discharge. Other conditions may cause severe itching, but the chocolate-brown, waxy discharge is typical of parasitic otorrhea. The *Otodectes* parasites are rather large for mange mites, being visible to the naked eye in many cases. A small hand lens may be helpful in finding the mites in the discharges removed from the ears. A simple procedure is to place the discharges on a piece of paper in sunlight or in a warm place. The heat soon causes enough activity on the part of the parasites that movement can be noticed with the naked eye. Within a short time, if parasites are present, they may be seen crawling around on the paper.

Under the microscope, this parasite can be differentiated from the sarcoptic mite by its legs, which are much longer and extend beyond the abdomen. Mixing some of the chocolate-brown, waxy discharge with a little mineral oil on a glass slide may help one to discover the parasite under the microscope, using low-power magnification.

Treatment.— Treatment consists of the destruction and removal of the parasites and the alleviation of the irritation produced by their presence. Cleaning of the ear removes the greater portion of the parasites and paves the way for the destruction of the young mites as they hatch out. The therapeutic problem presented by this condition calls for the use of an antiseptic, an anaesthetic and parasiticide. We not only have the problem of ridding the ear of the parasites present, but also the one of preventing a new crop from developing. We know that the many folds inside the ear hamper positive and complete cleaning. Our practice is to clean the ear and apply our treatment daily for four or five days. Then the ear is treated every three or four days for three weeks. The applications toward the end of treatment will be more of a protective nature than parasitic, such as zinc oxide ointment or petrolatum.

Our treatment the first few days destroys and removes the parasites. Our later bland treatment protects and soothes the skin lining of the ear and also from time to time removes eggs and newly hatched parasites. In many cases prompt relief follows the first three or four days' treatment, but there is a recurrence in a month or six weeks if treatment is not continued.

We do not know the length of time required for the hatching of the eggs. Monnig believes the life cycle may be similar to that of the *Psoroptes*, which would be about nine days from egg to adult. However, if treatment is continued occasionally for three weeks after the relief of symptoms, there is not likely to be a recurrence. Of course, complete cure can be followed by reinfestation.

Many different preparations have been employed in the treatment of parasitic otorrhea. Herms lists sulfur ointment, 10 per cent tincture of iodine in glycerin, and 1 per cent phenol in linseed oil. Hall uses eight parts of carbon tetrachloride in three parts of castor oil. Berge has used 3 per cent phenol in olive oil, and the following mixture: one part each of betanaphthol and ether in 20 parts of petrolatum; to this add 1 per cent phenol, 0.5 per cent cresol and 5 per cent salicylic acid. Brumley uses liquid petrolatum alone or with 5 per cent phenol added. Hutyra and Marek list 10 per cent oil of caraway in olive oil; equal parts of balsam peru and glycerin; also naphthol ten parts, ether 30 parts and olive oil 100 parts. We use one part of mercuric nitrate (citrine) ointment melted at a low heat and added to three parts of warm neatsfoot oil. We also use a 1:1,000 solution of mercuric bichloride in 70 per cent alcohol. Another mixture we use contains 20 parts of phenol, 40 parts of camphor and 40 parts of liquid petrolatum, especially in those cases where itching is intense.

The above list of preparations used in this condition is by no means complete. Each clinician seems to have his own particular parasiticide mixture that he has developed for the treatment of this disease. We have used a number of the above or similar ones and believe them all to be of value. However, we think that thorough cleaning of the ear of all wax and discharges is probably the most important part of any treatment for this condition.

Tumified Ear or Hematome of the Ear Flap

One of the sequels of otodectic mange is hematome of the ear flap or tumified ear. Rarely is a hematome of the ear flap caused by anything other than the dog shaking its head and breaking a blood vessel in the ear flap. If seen early, the enlargement is usually found near the tip of the ear. After a few hours or days the whole external ear may be involved. It has been our contention for years that the hematome occurred between two layers of cartilage. A recent histological study of the cartilage of the concha seems to indicate that there is only the layer of cartilage. If such proves to be the case, then we will have to consider that the hemorrhage occurs between the lining skin of the ear and the cartilage.

Treatment.— Our treatment has been to incise the hematome on the inner surface of the ear, to clean out all shreds of fibrin and to quilt the medial and lateral surfaces of the hematome together. We do this under as nearly aseptic conditions as possible. To protect the ear afterward, we pad both ear flaps with cotton, lay them back over the head and apply a night cap, or many-tailed bandage, to hold them in place. By so doing, we hope to prevent further shaking of the head and also the entrance of infection. If infection can be prevented there is a fair chance that the ear flap will heal without crinkling.

We have tried daily aspiration of the fluid in a few cases. This has not always been successful because of seepage of serum into the hematome cavity. In one case we were successful in using aspiration because we were able to insert a cotton plug into the ear canal and bind the flap around this plug so that some pressure was applied to the ear. This seemed to hold the inner surfaces of the hematome in contact so that they healed together. In one case, after draining a small hematome of the ear, we held the surfaces together by applying a paper clip. The next time we tried it, the pressure apparently was too great because there was scar formation at the point of contact of the clip and also permanent loss of hair. In another case a German Shepherd, the dog was able to shake his ear out from under the night cap. To protect the ear during the healing process, after quilting we bound the ear around a plug of gauze and then alipped a length of small size stockingette over the ear and tied the base of this tube around the head. In this case the ear stuck out straight from the head with the result that there was less effort on the part of the dog to rid himself of the bandage.

In the case of hematome of the ear in cats, Dr. Milks and the writer have been quilting the ear through holes in two metal plates. By so doing, we have obtained fairly even pressure. We also have been able to shape the plates so that the ear flap healed more nearly in its original shape. The plates were made by cutting thin sheets of aluminium, obtained from an aluminium sauce pan, to the size and shape required. Numerous holes were bored through sheets to reduce weight and to allow for suturing through and through.

Before leaving the subject of hematome of the ear flap, we would like to say that we do not recall a case in which there was not some irritation in the ear canal. In most cases it could be demonstrated that parasitic otorrhea existed. If treatment of the hematome is not accompanied by treatment of any irritation of the lining of the ear, recurrence is quite liable to follow.

Catarrhal Otorrhea

Catarrhal otorrhea is similar to the moist eczemas of the skin that are found on other parts of the body. In this condition there is a continual discharge of purulent material from the ear. The infection present may be the result of a parasitic otorrhea, the accumulation of dirt, the presence of foreign bodies, the breaking down of tumours, distemper and excess moisture.

Symptoms.—If only one ear is affected, the dog usually holds the head sideways with the diseased ear down. There is some itching. The condition is painful and, because of this, scratching, shaking and rubbing of the ear are done carefully. Manipulations of the ear results in pain and also gives a "squashy" sound. In a beginning case the exudate from the ear is thin; later it becomes thick, yellowish, purulent and sometimes streaked with blood. The parts of the ear which come in contact with the discharges are inflamed and quite tender. After this condition has existed for some time, there may be ulceration of the lining of the ear and exposure of cartilage.

Treatment.—Before the application of any particular drug is tried, the discharges, must be removed as completely as possible. This can be done either with dry pledgets of cotton or by washing with various solutions. The solutions most commonly used are soap and water, ether, boric acid solution and chlorine solution. The ear should be dried after cleaning. The use of an otoscope at this point will be a great aid in determining the extent of damage done to the lining of the external ear.

Medication may be antiseptic, astringent or absorptive and drying, or a combination of all three. Occasionally it is necessary to apply a local anaesthetic. We have used butesin-picrate ointment, butyn solutions, 5 per cent phenol in glycerin and campho-phenique for this purpose. Of the antiseptic solutions the following are frequently used and found valuable in controlling the infection: 1 per cent chloramine; alcoholic and aqueous solution of tannic acid, freshly prepared, and also 5 per cent each of tannic and salicylic acids in alcohol. In beginning cases we believe we have more rapid results when we apply a 5 per cent aqueous solution of silver nitrate to the lining of the ear. Practically all dusting powders are of value in this connection as they tend to dry up the excess secretions. The application of a mild ointment, such as zinc oxide ointment, is of considerable value in protecting those parts not already affected.

No two cases of catarrhal otorrhea can be treated exactly alike. The form of treatment that seems best in one case may prove a failure in the next. The general principle of using astringent or drying drugs should be

adhered to, but frequently the treatment used must be changed a number of times during the handling of a particular case.

If ulceration of the lining of the ear has occurred with exposure of cartilage, the case will be more difficult to treat. We not only have the job of controlling the infection, but also of encouraging the healing of skin over the denuded cartilage. In many cases the condition has lasted long enough to bring about narrowing of the canal to the point where the application of drugs is nearly impossible. In many of these old cases our only chance of bringing about relief is to resort to slitting of the cartilage so as to expose the canal. We were rather hesitant to do this in our first cases because we thought there might be too much disfiguration. We now feel that when the lining of the ear is so thickened that we cannot properly treat it, we will save many such cases by resorting to this operation. We not only provide drainage, but also expose the parts so that treatment is much easier.

We slit the ear on the outside with a knife, scissors or the electro-surgical needle down as far as the right angle turn toward the ear drum. We used to take out a v-shaped piece of the cartilage, but no longer find this necessary. We sew the external skin to the internal skin lining of the ear. We sew from the inside outward as that seems to allow us to get a better hold for our suture in the skin lining the ear; at least, we can insert our needle better in that manner. Sometimes the bottom of the slit gives us a little trouble in sewing. An occasional case is so badly infected that our suture line becomes infected also, and the stitches break loose. Of course, this results in delayed healing of the incision, but we have to risk such an occurrence. After the lining is exposed, we can treat the exposed ulcers much more readily than before. Drainage is greatly improved. Even if we are not able to bring about healing, after slitting the ear canal in these chronic cases, we do accomplish something. The dog is much more comfortable than before. The relief from pain is well worth the effort in many cases. The scar is not very noticeable even in prick-eared dogs.

Otorrhea Cerumenosa

Otorrhea cerumenosa is characterized by an excess of cerumen or wax formation in the ear canal. The symptoms are itching and the presence of an excess of wax. The wax may range in color from grey to yellow to brown. The wax in the dog's ear is rarely found to be as firm as that in the ear of man. The wax may range in consistency from soft to pasty, and even sometimes semi-fluid. If there is decomposition of the wax, the odour will be fetid. As far as we can tell, the cerum or wax glands are distributed throughout the whole lining of the ear canal. A great deal of itching accompanies an excess production of wax. In some cases the lining of the ear

will be thickened and erythematous. Many cases do not recover rapidly and the condition may last for years with intermittent periods of relief.

Treatment.— Treatment consists of cleaning the ear and applying those drugs which seem to have a tendency to lessen secretion from the skin. These are salicylic acid, resorcinol and tannic acid. If salicylic acid is used either in solution or in ointment, the percentage should be kept low, as the skin lining of the ear is more susceptible to damage from salicylic acid than the skin of other parts of the body. We have found an alcoholic solution of $1\frac{1}{2}$ per cent salicylic acid and 5 per cent glycerin to be useful in controlling this condition. In our most recent cases we wiped over a tablespoonful of soft, grayish wax from one ear. The lining was slightly thickened and reddened. We applied zinc oxide ointment. The erythema subsided as did the production of wax. The dog feels much better, but will probably be brought back to us again, as he was last fall, and also last spring.

Comment

Before closing, I would like to stress two points. First, no one standard treatment will suffice for all cases of otorrhea; treatment should be based on what we see in the course of our examination. Second, over-treatment will delay healing nearly to as great an extent as undertreatment. Protective bland applications are valuable.

Journal of the A. V. M. A., February 1941.

CARE OF HORNS*

BY

T. N. KULKARNI, G. B. V. C.,

Veterinary Assistant Surgeon, Ron, Bombay.

Horns of cattle are the chief organs of defence for them. They vary in size and shape, in different classes of animals. The horns of buffalo class of animals, are rather flattened and mostly long. The shapes of horns of bullocks are generally upwards and forwards but upwards and backwards are also found. The shape of buffalo horns are mostly outwards and backwards and therefore the buffalo takes an awkward position of the head while in yoke. The round horns of cattle are more hallow than the flat horns of buffalo. Buffalo horns therefore fetch better price. The shorter

* Paper read at the Annual Conference of the Bombay Veterinary Medical Association, held at Dharwar, in December 1940.

the horn, the less it is hollow. The horns of country-bred bullocks are not long and therefore they are less hollow. The horns of Krishna Valley bullocks are thick and short and therefore they are less hollow. The horns of "Khilari" and Moodal—Amritmahal—Mysore breeds of cattle are long and therefore they are more hollow. This is the general condition of the horns but there may be a few exceptions. There is one more condition of the horn, which is called in Kanarese as "Togal-kodu" which means "Skin horn." This condition of the horn is shaky at the root but is normal.

Diseases of horns as met with in practice, are few. They are, cancer horn and fracture horn. Only fracture horn is treated here. Fracture horn is due to two conditions. Firstly it may be due purely to direct accident when the horn is in normal condition. There is another condition which may be styled as "artificial". In this condition the horny-core is pared deep, as to reach the fleshy part and cause a wound and a hole in the horny-core. There are instances where the slightest concussion of the horn has caused fracture on account of weakening of the horny-core, due to deep paring which normally would not have caused fracture.

Paring of the horn, like docking of the tail of dog, is resorted to, as a hobby, to improve the outlook of bullocks. Paring of the tip of the horn to fit brass caps, is a harmless operation. But paring of the superficial layer of the horny-core of the horn, is undertaken to have the horns appear well polished. This is essentially done in case of Khilkar and Mysore breeds of bullocks. Generally cattle dealers do it to get better price. They, after paring smear the whole horn with some paint or oil to have shining appearance. Cultivators too resort to paring of the horny-core. This operation is done generally by the farrier who keeps a paring knife. I have seen individual owners also undertake this operation. In some cases, instead of paring the superficial layer of the horny-core with the idea of levelling the surface, they go so deep as to cause fracture of the horn and wounding of the fleshy part of the horns. There are instances where both the horns are affected in this way.

During the past six months, 25 cases were treated in Ron Veterinary Dispensary for the diseases of horn. Out of 25 cases, 8 were cancer horn cases and 17 were fracture horn cases. Of the 17 fracture-horn cases, 4 were purely due to accidents in normal state and the remaining 13 cases were due to direct or indirect results of paring.

The thickness of the horny-core of an average horn of 18 inches long is about $\frac{1}{4}$ inch at the centre with slightly increased thickness at the base. The tip of the horn is solid about 3 inches.

Paring of the horny-core is a bad practice which exposes the horn to easy accidents. It is the duty of every veterinarian to advise the cultivators

on this matter. They should be advised not to purchase the bullocks whose horns have been pared, as they are liable to easy accidents. They should also be advised not to undertake paring as they are ignorant of the thickness of the horny-core and the bad consequences afterwards. Epistaxis is likely to be caused when the horny-core so pared gets heated in summer.

In my observation it is seen that there are more cancer horn cases in bullocks than in cows or buffaloes. This makes one to suspect that the infection of cancer is carried probably through the weakened horny-core due to paring.

The cultivator pays high price for good such bullocks, pares the horny-core to have a better look but the consequences are bad as described above and he becomes very much dejected and is put to a great loss. This is therefore a warning to him regarding the paring of the horn.

"MAL-PRACTICE OF PHOOKA AND ITS CONSEQUENCES."

BY

D. B. KHOLE, G. B. V. C.,

Hospital Surgeon,

*Bai Sakarabai Dinshaw Petit (Animal) Hospital
And Bombay Veterinary College, Bombay.*

History

At the Sakarabai Dinshaw Petit (Animal) Hospital, I happened to come across a case of phooka in a cow the history of which ran as follows :

The Chief Veterinary Inspector attached to the Society of Prevention of Cruelty to Animals, Bombay, prosecuted the owner of a cow under the Phooka Act and brought the animal to the hospital for examination. The examination revealed that there was congestion of the mucous-lining of labia vaginalis and by gentle manipulation of the affected part, the animal used to urinate. A certificate was granted to the effect and the man was convicted by the court.

Observations.

During the stay of the cow in the hospital for about a month, I observed that the animal was very much ill-tempered and nervous ; she was quite unmanageable at the time of admission. As days passed on, the animal

used to be violent at the sight of a man. I considered over the point and could not come to a conclusion whether this "change of habit" would amount to vice or accidental change of temper. This question was further discussed with the Principal, Mr. Mohey-Deen and he was of opinion that it might be due to the insertion of a powder. I was at a loss to know whether the owner practised such a thing to make the animal frightened and nervous and thus to yield more milk or whether he did it because the cow was mischievous and unmanageable.

Previous history of the cow showed that daily insertion of powder into vagina before milking made the animal nervous, obstinate and uncontrollable by strangers, though she could be controlled by the owner.

Kindness, coaxing and patting the animal gently at the time of milking showed an improvement in her behaviour but the quantity of milk was diminishing gradually. Generally, "graded cows" from milk-yield point of view are good milkers and this cow might not be an exception to that; but the greediness of the owner to obtain more milk by "phooka" made the animal irritable and ill-tempered.

Physiological Aspect.

What is phooka? It is an act of blowing air or the insertion of any irritant into the vaginal passage with the object of making the animal yield more milk. Mucous membranes of organs are sensitive, but some are more so where the nerve supply is greater. In ordinary milking tickling of the teats is quite sufficient to bring congestion which sympathetically brings stimulation to the udder, while in phooka to bring stimulation to the udder congestion is to be produced by some irritant substance introduced into vagina. Stimulating the nervous system off and on unnaturally, invariably brings on irritability of nerves which frequently develops into vice. Is it psychological reflex or physiological action? It may be probable that the first two acts are quicker in action than the third one.

Experiments.

Since the cow was very debilitated I took the opportunity to test the animal for tuberculosis, but it proved negative. Microscopical examination of milk and animal experiments as inoculation into guinea pigs also proved negative. It was more than a month since the animal was in the hospital and careful observation every day brought to my notice that the cow grew more docile day by day and had shown, though not very perceptible, an improvement too. From this one should understand that nervous irritability brings general changes in the constitution. This case has clearly proved that the phooka methods used by ignorant people are really cruel and should be discouraged and condemned wholesale.

Discussion.

Here and there, in India, through ignorance, keepers of the dairy animals — poor as well as rich — adopt such method during the lactation period with the result that the animal becomes sterile. It is a decided fact, from breeding-point of view, that phooka is very serious and most injurious to the animals' health. It is more prevalent in cities, although villages are not free from it. Veterinary Surgeons who come across with such cases should immediately take legal steps in the matter and rescue the poor animals from the tortures of the wicked folk.

Conclusion.

It can be concluded that wildness or brutal character acquired by the subject in question was entirely due to "phooka."

I would like to thank Mr. K. R. Aiyer, G.B.V.C., who willingly rendered help in the bacteriological examination and inoculation of experimental animals.

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Vitaminosis B

From what is coming to light about the vitamin B complex, there is little doubt that an insufficient amount of this factor is contained in the regular rations of man and higher animals. The deficiency syndrome runs through the whole gamut of nervous and asthenic symptoms: irritability, depression, fatigue, inappetance, constipation, convulsions, paralysis, heart failures, hysteria.

Of the twelve fractions of vitamin B now known, five have been produced in crystalline form: nicotinic acid, thiamin chloride, riboflavin, pyridoxin and pantothenic acid.

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Editorial

THE CEYLON VETERINARY ASSOCIATION

The pretty little island of Ceylon lying south of India is making history in the Veterinary world. Just a year ago, in July 1940, the members of the Veterinary profession in that land who were a 'loosely scattered lot' decided to organise themselves not only "in their own interests but also to make their contribution to the development of Animal Husbandry in that country." The result was the formation of the Ceylon Veterinary Association. The first Annual report of the Association which has been received by us now gives us an indication of the spirit of earnestness and enthusiasm with which the members have started on their work. Whether in Government service or in Private Practice, whether in active duty or in the retired list, the members of the profession in that island have banded themselves together to advance the profession in all possible ways. We note with pleasure that the activities of the Association are ably guided by its President, Mr. R. J. Little, Municipal Veterinary Surgeon, Colombo, (whose sparkling sprightly face adorns the frontispiece of the report) assisted by the energetic secretary Mr. Hector C. Perera.

We are very glad to note that the Association has started on its activities during the first year of its existence in the right direction by paying prominent attention to propaganda work. Too much emphasis cannot be laid on this aspect of the

work of the Association because it is only by educating the public on the various problems of Animal Husbandry that the Veterinary profession can come into its own. In the past and even in the present, it has become a habit with the Veterinarians to hide their light under a bushel and develop what one should regretfully call an inferiority complex. On that account it often happens that the work of a Veterinarian, however fine it may be has remained unknown and unrecognised. It is therefore pleasing to note that the Ceylon Veterinary Association has begun its work by paying attention first to the Education of the Public on matters relating to Animal Husbandry. More than twenty articles of popular interest have been contributed by the various members of the Association to different popular periodicals and we are sure that these articles are bound to draw the attention of the public to the potentialities of the Veterinary profession. (We wish these articles had been published as an annexure to the Annual report for ready reference of readers. Probably this is a bit of Newsprint economy necessitated by war conditions.) The prevailing popular impression that the Veterinary Surgeon has no other duties or functions except to attend to the ailing and sick animals should be dispelled. The public must be convincingly told that a Veterinary surgeon is something more than what his title means and that he has very many functions such as eradication of diseases by paying attention to nutritional and genetic aspects of Animal breeding and also safeguarding of Public Health by a thorough examination of animal products intended for human consumption. The functions of the Veterinary surgeons should be constantly kept before the public mind by periodic contributions to the lay press and therefore we would earnestly advise the Ceylon Veterinary Association not to slacken their propaganda work but to keep it up and even improve it by supplementing with magic lantern or cinema demonstrations of Veterinary Subjects.

We wish the young Association all success in its efforts "to advance the profession's prospects and scope of its usefulness".

Clinical Articles

BREECH PRESENTATION OF A MEGALOCEPHALUS MONSTER IN A COW

BY

D. B. SAPRE, G.B.V.C.,
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Junnar, Poona.*

Subject :—A country cow, aged three years belonging to a villager of Manikdoto, Taluka Junnar, was admitted as out-patient on 8th November 1940.

History :—The cow which was in her first pregnancy had completed the full term. It was showing signs of calving on the 7th of November 1940, in the village; the water bag had burst and the hocks of the calf were just visible outside. As there was no further progress, the owner tried his best to remove the foetus but only in vain. Therefore he brought the animal to the Veterinary Dispensary, Junnar, in a cart on 8th November 1940.

Immediately on arrival half an ounce of chloral hydras was given in treacle and the case examined with the normal antiseptic precautions.

The case was evidently one of posterior presentation.

The buttocks and hind hoofs were the first parts that the hand encountered, followed by the croup and the haunches. As the calf was dead and bloated, I punctured the abdomen and let out copious liquid and gas. I passed a cord with a ring round the hocks and secured the same. With the help of three of my assistants, I applied traction and thus removed the foetus.

The peculiarity of the foetus was as follows :—

1. It was a 'Megalo-cephalus Monster' the head erect and frontal bones flat.
2. The lower lip protruded a little farther than the upper and the dental pad absent.
3. Both the fore limbs were intertwined.
4. The hocks and knees were highly developed at the expense of the canons. The pasterns were very short.

5. The spinal column bent like a bow.
6. Most of the internal organs were found to be normal except the right lung which was very small.

The cow was given a saline douche and discharged in the noon as the owner was unwilling to stay. Before discharge, a stimulating dose was administered.

CÆSAREAN SECTION IN A BITCH

BY

V. V. VENKATACHALA AYYAR, G.M.V.C.,
Veterinary Assistant Surgeon, Madura City.

A bitch was brought to the dispensary at 5 P. M., on 4-4-40, with the following history and symptoms:—

Advanced stage of pregnancy, dullness and inactivity for the previous 3 days, feeble infective labour pains now and then.

On examining per vagina, it was found that one of the limbs of a foetus was in the passage but the Os was not fully dilated. Application of the forceps was found difficult and there was a suspicion of uterine rupture. It was therefore decided to deliver by cæsarean section.

After the usual preparation, the patient was given chloroform anaesthesia and she was well under in about 8 minutes.

An incision of 6 inches long was made on the median line, muscles were separated and secured taking care not to injure blood vessels. Simple dry sponging alone was resorted to. Peritoneum was incised and secured separately. The abdominal organs were gently pushed to a side and the uterus exposed. An incision 6 inches long was made on the uterine wall and the edges were secured. The fluid contents of the uterus were gently sponged out, care being taken to see that none fell into the peritoneal cavity. Two dead pups were removed from near the cervix and two live ones from the left horns. The live pups were attended to by the timely removal of foetal membranes, etc.

On examination of the uterine wall it was found to have had a rupture about 2 inches long at its superior aspect.

The uterus was gently taken out of the abdominal cavity and its interior cleaned and sponged with 2 per cent Acriflavine solution. The

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rupture and operation wound were sutured with sterile catgut and the uterus replaced. Peritoneum and muscle were sutured separately with catgut and skin wound with silk ligature. A pad of gauze and cotton was applied over the wound and bandaged.

Second day.—Temperature 104° F. There was a little discharge from the wound. It was cleaned and rebandaged. 3 c.c. camphor in oil was given subcutaneously.

Third day.—Temperature 104° F. She was given quinine mixture. The wound was dressed with H₂O₂ and Boro Iodoform.

Fourth day.—Temperature 104° F. Repeated internal and external treatment.

5th to 15th day.—Dressing was continued. Quinine mixture was discontinued on 10th day and carminative with tonic substituted.

Result.—The patient was discharged cured on 26-10-40 and she is quite well now. One of the pups which was very weak died on the 8th day but the other is alive and well.

A CASE OF MULTIPLE HYDATID CYSTS IN THE INTERNAL ORGANS OF A COW

BY

V. V. VENKATACHALA AYYAR, G.M.V.C.,
Veterinary Assistant Surgeon, Madura City.

A country bred milking cow was brought to this institution on 19-6-40, with the following history :—

The animal was quite healthy the previous evening and was left in the shed as usual. She became suddenly ill showing great distress in breathing at 2 A. M. Stopped eating and ruminating. She was walked forcibly from the house to the hospital (literally she was pushed from behind), as she had no inclination to move.

On examination, the animal was found with her head and neck extended, fore limbs kept wide apart, anxious look, more disposed to stand than lie down, tongue protruded, frothy saliva dribbling showing all evidence of Dyspnoea. Her temperature was 100.4° F and auscultation of lungs revealed dullness of both lungs.

To allay this distress in breathing, I tried to give her an electuary containing Adrenalin and Chloretone, but she was not able to swallow it.

Suspecting it to be a case of choking, I carefully examined the pharynx and the cervical portion of the oesophagus but could not detect anything abnormal. I therefore decided to pass the probang and got everything ready for the operation but in the meanwhile the animal fell down suddenly and died within about 20 minutes of its coming to the hospital.

I advised the owner to leave the carcase at the hospital for post mortem examination, as I was very anxious to know what really caused the urgent symptoms and death.

On opening the abdominal cavity a small quantity of peritoneal fluid was found but the peritoneum itself was quite normal. The liver, spleen and lungs were found studded with cysts varying in size from a marble to an apple. About 60 such cysts could be counted in the lungs alone. Two of the size of a lemon were found on the trachea at its entrance into the thorax. Three big cysts were found to have ruptured in the lungs.

Extensive destruction of normal lung tissue, pressure on the trachea and discharge of cystic fluid into the lungs caused the urgent symptoms of asphyxia and death.

The cysts were sent to the Principal, Madras Veterinary College, who kindly identified them as 'Hydatids.'

Remarks.— This happens to be an instance of mistaken diagnosis and my endeavour to pass the probang would surely have caused the poor patient greater distress and no relief.

CLINICAL ASPECT OF ANTHRAX AND HAEMORRHAGIC SEPTICAEMIA AS MET WITH UNDER VILLAGE CONDITIONS.*

BY

G. G. CHEBBI, G.B.V.C.,

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Anthrax and Haemorrhagic Septicaemia are two of the important epizootic diseases to which our livestock of the bovine class fall a prey periodically. The Veterinarians are called to control them. The intimation reports received from the village officers regarding the outbreak of the

* Paper read at the Bombay Veterinary Medical Association annual conference, held at Dharwar in December 1940.

disease in their villages is so vague that the field workers have to depend for the diagnosis of the disease, on the symptoms of the affected animal as narrated by the cattle owner, or, on the examination of the sick cattle at the time of the visit, or, at times, by the holding of post mortem examination on a dead animal. Of course microscopical examination and biological test are the final conclusive evidences.

The symptoms of both these diseases of acute type would be very few and not forthcoming many a time. It is on a rare occasion that one meets with a case as described in text books. It is only the experience that ultimately guides us correctly. I had an opportunity of attending to as many as 36 outbreaks of Anthrax and 114 of Haemorrhagic Septicaemia during the past 3 years and 8 months at Dharwar (since 1-4-1937 to 30-11-1940). During the course of attending to them 29 specimens of blood for Anthrax were got examined and 9 were positive and in Haemorrhagic Septicaemia 34 specimens were got examined with 13 positive. With this much of data at my command I have tried to summarise the disease comparatively with a hope that they may be of some use to a field worker.

Species of animals affected and their ages

Generally in Anthrax, adults and aged cows have been found to be the first to get the disease in a majority of outbreaks. Buffaloes and young ones are by no means immune : but they come next in order.

While, in an outbreak of Haemorrhagic Septicaemia, young buffaloes are found to be the first victims but as the disease spreads, casualties among adult buffaloes and cows occur.

Season

The period from the close of winter to summer appears to be the favourable season for Anthrax : notwithstanding this, sporadic outbreaks may occur at any time during the year.

Haemorrhagic Septicaemia outbreaks generally commence with the advent of monsoon when the first grass grows after showers and the disease comes down about September.

Locality

As regards locality, low lying marshy places of Malnad tract where there will be clogging of water and beds of nallas in plains, have been found to be the hot beds of both these diseases.

Symptoms

I am not touching the acute cases of Anthrax as opportunities to observe them are very rare. The only history that may be forthcoming in

such cases is, sudden death of susceptible cattle on grazing area or in cattle byre, before day break, which leads us no where. But in sub-acute cases of Anthrax that were mostly observed by me in Kalaghatgi and Dharwar Talukas where the disease proved positive on microscopical examination, the following symptoms were marked. The animal will go partially off feed, stand dull and stiff with swinging head and there will be slight dribbling of saliva but the tongue will be unaffected. Swellings may appear on throat, jaws or any part of the body and death after two, three or even four days of attack. Percentage of recovery is 5 to 30 per cent. in this disease.

But in a case affected with Haemorrhagic Septicaemia the animal will be completely off feed with inflammation of the tongue and throat and with profuse salivation. Breathing will be sterterous producing hoarse sound which could be heard from a distance and terminating in death from within a few hours to 24 hours. If it survives that period recovery is probable. The mortality percentage is very high — 99 per cent.

Morbid changes

All the post mortem examinations were done with all the necessary precautions.

In Anthrax, subcutaneous tissue under the lesion will be infiltrated with yellow gelatinous exudation and peripheral veins, when cut will exude thick tarry blood.

Heart and Lungs.—These are the secondary seat of lesion with lesser degree of congestion due to septicaemia. The right ventricle will be either empty with the endocardium stained with the tarry blood or it may contain a little of non-coagulating tarry blood. Left ventricle is mostly empty.

Spleen.—Spleen will be typically swollen and enlarged about 4 or 5 times the normal size and when cut the pulp will be soft and could be drained off if held up with the apex.

In Haemorrhagic Septicaemia there could be seen haemorrhagic infiltration of the subcutaneous tissue with thin icterous exudation.

Heart and lungs are the chief seats of lesions. The covering of the inner lining and the muscular tissue of the heart are all generally inflamed causing peri-endocarditis and myocarditis. The right ventricle will usually show a blood clot in one mass the colour of which will be deep chocolate. Lungs will be found with stained blocks of congested area in varying degree as in the case of lobular pneumonia.

Trachea and Bronchii will be mostly studded with white frothy stuff.

Lastly I may point out that there is one seriological test for Anthrax called "Ascol's thermo precipitation reaction" advocated in 1935 as the only *post mortem* test:—(*Vide Bacteriology by Day and Chatterji, p. 366*).

Technique of the test.—Take a piece of spleen from the suspected animal and boil with ten times N. S. S, cool and filter. To the filtrate add some immune serum by pipette into the bottom—a progressive deepening ring of turbidity appears at the junction of the fluids, if the disease is positive.

If this test could be done by the Veterinary Assistant Surgeons in the field, I think there would be rapid diagnosing of the disease.

Reference

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Personal Notes.

A CASE OF AVIAN TUBERCULOSIS.

BY

K. N. KRISHNAN, G. M. V. C.,

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Subject ;—*Austrolop* hen, three years old.

History ;—A good layer, laying from 200 to 250 eggs a year. About the beginning of July 1938, the hen suddenly stopped laying and went off its feed. The feathers started falling off and never grew again. The owner of the bird who knew something about poultry, diagnosed the condition as indigestion and treated it with various medicines. About two months after the treatment the bird's appetite returned ; but it was gradually losing condition. It was brought to the hospital for treatment on 9-11-38. The bird presented a typical picture of emaciation. Its coat was very pale, so also the mucous membranes. It could not move as paralysis of the legs had set in. Its temperature was low, 104°.

Treatment.—The condition was tentatively diagnosed as anaemia and it was decided to put the bird on a course of iron tonics. But it died the next day after admission into the hospital.

Result.—A post mortem examination was made. The chief post mortem findings were :— 1. Small tubercles in the liver and spleen, 2. Congestion of the kidneys, 3. Patches of congestion in the intestines. The other organs were, normal. The organs were submitted to the Principal, Madras Veterinary College, for examination and his report is as follows :—

Report of the Principal.

1. Liver:—Caseating tubercles, in which, acid fast bacilli indistinguishable from myco-bacterium tuberculosis present.
2. Kidney:—Cloudy swelling of the tubules with colloid cysts in them indicative of tubular nephritis.
3. Spleen:—Caseating tubercles in which acid-fast bacilli indistinguishable from myco-bacterium tuberculosis present.

Remarks.—I believe that some birds die of tuberculosis every year at Kodaikanal, though this is the only case I have come across during the course of my stay of 2½ years in this place. When a bird is sick, the owner generally kills the bird and thus there is no chance of proving the extent of the prevalence of tuberculosis among fowls. But a fowl with a history of progressive emaciation may now reasonably be suspected for tuberculosis.

TREATMENT OF OSTEOPOROSIS IN HORSES.

BY

V. D. Ratnam., G. M. V. C.,

Veterinary Assistant Surgeon on Glanders Duty, Madras.

In my article on the diagnosis of Osteoporosis in horses published in the Indian Journal of Veterinary Science and Animal Husbandry, Vol. X, Part 1, March 1940, (published elsewhere in this issue of this journal) it was recorded that 12 out of 22 cases of Osteoporosis treated with Calcium Carbonate showed some improvement. But the improvement was not 100 per cent. to give a negative test when the animals were subsequently tested for Osteoporosis. As I could not get the drug Colloidal Magnesium Hydrate anywhere in India or in England, the question of substituting it with a suitable drug to help the absorption of Calcium and its retention in the system was often engaging my attention.

It was observed that, with the administration of Calcium Carbonate alone some animals definitely took a very long time to show any appreciable improvement; in some cases, the improvement noted was even almost negligible. For instance, two horses which were suffering from lameness of obscure origin and which gave a positive test for Osteoporosis in the beginning, took nearly eight months to give a negative test. These animals went sound afterwards and one of them won a Gymkhana Hunt Race at Ootacamund during the last season. Two other horses, which were always lame and which gave a positive reaction to the test, had Calcium Carbonate for a pretty long time (nearly nine months) but no appreciable improvement was noticed either in the lameness or in the hardening of the frontal bone when

tested again. These two animals were therefore destroyed and on p. m. one was found to be suffering from Ulcerative Arthritis on the digital and of the off-fore canon bone and the other was found to be suffering from Navicular Disease in a bad form on the near fore.

The treatment was therefore modified and the following combination of drugs was tried :—

Calcium Carbonate.	1 oz.
Bone Meal.	1 „
Mag. Sulph.	2 „

This is to be given either in one or two feeds daily for two or three months ; if required it may be given for a longer period.

This treatment has been found to give satisfactory results in cases of Osteoporosis in early stages. After giving a fairly long trial to this treatment, I am of opinion that if the animals are treated in the early and incipient stage, many cases of obscure lameness in horses due to Calcium deficiency can safely be avoided.

In this connection I would like to mention that, before this test and treatment was adopted by me in the Body Guard, the average number of cases of lameness for a day was from 6 to 8. Now practically during the last one and a half years during which this test and treatment has been practiced, the incidence of cases of lameness has gone down very low, it is less than one or two a day. The animals also are in a much better condition then they were ever before.

AZOTURIA

BY

S. A. Sastri, G. M. V. C.,

Veterinary Asst. Surgeon, Ootacamund.

This disease is frequently met with in the hills. Idleness and rich diet are supposed to be the cause of this condition. I furnish below details of two cases treated by me in Ootacamund.

Subject.— Bay Australian mare, aged about 12 years.

History.— On 25-8-40 the animal which was getting a rich diet of concentrates and only gentle walking due to rains was ridden in a good hunt in drizzling rain. Suddenly it began to perspire profusely and show colicky symptoms (turning the head to the flank). It passed small quantities of bloody urine at repeated intervals and was terribly lame off hind. The mare was taken to the stable with the greatest difficulty.

I saw her in the stable. Temperature 102.2°. M. M. highly congested, enormous swelling at the off-hip, and little at the near hip. The animal was restless, would not touch grass, or drink water, was stamping the ground ceaselessly and attempting to lie down. Suddenly she went down, stretched out her legs and could not get up easily. Realising that it is unsafe to allow her to be in the recumbent posture a long time, she was forced to get up. She did so with great difficulty and assistance.

The pulse was rapid, respirations accelerated, and heart was palpitating.

Treatment.— Hot fomentation to the hip every two hours and application of Linimentum Belladonna. Stable bandage to all four legs. Massage of the hind limbs. A pint of linseed oil with half an ounce of chloral hydras and two drams of Pot. Iodide was given by stomach tube. Warm soap water enema was also given. Two drachms of liquor adrenalin hydrochloride was injected subcutaneously morning and evening.

Plenty of linseed tea was ordered for drinking and the animal drank it well, but it refused bran mash. Carrots were given in small quantities. Gentle walking exercise was ordered every two hours.

Examination of the blood and dung was negative.

26-8-40. Temperature 101.8°F. M. M. a little clearer. No motions, urine slightly less bloody, but highly albuminous. Swelling over the hip less tense. Prescribed two drams of Acid Boric and Pot. Acetas, morning and evening in drinking water. Fomentation and Linimentum Belladonna to the swelling was continued.

27-8-40. Temperature 100°F. The mare had several broad motions, urine was normal. M. M. pale. The animal lay down and got up easily. Swelling became reduced greatly. The powders were continued.

28-8-40. Motions still loose. Continued the powders. Urine clear, swelling much reduced. The animal was given small quantities of oats and bran. The animal was allright in another three days. Regular work was ordered after ten days.

CASE II

Subject.— Chestnut Irish Gelding, age six years. Took ill on 1-12-40.

Symptoms.— Off-feed, slight colicky pains, scanty amount of bloody urine. M. M. congested. Temperature 103°F. Hard tense swelling both hips.

Treatment.— The same treatment as for the first case was adopted with almost the same results. But the urine had to be removed on first visit by catheter. Third day the urine was highly albuminous and whitish.

WORM IN THE ANTERIOR CHAMBER OF THE EYE OF A BULLOCK

BY

K. S. PRAKASA RAO, G.M.V.C.,
Veterinary Assistant Surgeon, Bezwada.

History.— An Ongole bullock, case No. 900, aged 12 years, was admitted into the veterinary hospital, Bezwada, on 19.7.40 with the history of lachrymation of the right eye for some time past with subsequent intractable opacity. The animal was purchased by the owner four months previously and as far as the owner could remember, the animal was given only tap water to drink.

Symptoms.— There was a dense opacity of the eye ball with lachrymation and photophobia. On irrigating with 1 per cent saline solution, the wriggling of a worm in the anterior chamber of the eye was noticed.

Treatment.— The animal was thrown and secured. The eye was cocained with 4 per cent. solution. The cornea was punctured at the limbus and the worm was extracted. About 2 drops of 1 per cent. solution of Atropine Sulph was dropped into the eye and the animal was released. Subsequent treatment consisted in irrigating the eye daily with saline solution and dropping into the eye a few drops of 1 per cent Potassium Iodide Solution till 25.1.41. The animal made an uneventful recovery.

The worm has been identified as "Immature female *Setaria Labio Papillosa*"

MILK FEVER

BY

S. A. SASTRI, G.M.V.C.,
Veterinary Assistant Surgeon, Ootacamund.

This disease is frequently met with in heavy milkers such as foreign and cross bred cows and of all ages.

Generally it is noticed on the second or third day after calving.

For the last six months I treated 4 cows (3 English and one cross-bred) of an average weight of 1000 lbs.

In the first case, the cow became sick on the third day after calving. It lay down on her brisket turned her head round, resting on the chest, with her nose pointing towards the flank.

Temperature was normal, breathing laboured. General appearance sleepy, urine was not passed for 12 hours.

Treatment:— Warm soap water enema was given and urine was removed by catheter. Gave a subcutaneous injection of

Calcii Sandoz 1 ounce
Acid Boric 3ii
Aqua Distillata 8 ounces.

The powders were well mixed and the liquid boiled, cooled and filtered.

The udder was insufflated after removal of milk and the teats were tied with tape to retain the pumped in air. The owner was instructed to remove the taps after the cow got up. It was up in two hours and was perfectly fit and required no more treatment.

The other cases were treated on the same lines as above.

One cow however had a relapse on the second day. The first injection had its effect and the cow rose to her feet in two hours. But after 24 hours she was down again. She was given another similar dose and this made her rise up in one hour.

Thereafter she was perfectly fit.

TOBACCO POISONING IN A CALF

BY

V. VENKATARAMAN, G.M.V.C.,
Veterinary Assistant Surgeon, Dindigul.

Subject:—A local bred she calf, aged about 16 months, in fair condition.

History:—The calf was said to have eaten inadvertently about a couple of dried tobacco leaves with straw, on the morning of 29-12-40 and in about two hours she was found sick.

Symptoms:—Very dull, depressed, shivering, salivation, pupils dilated, had a vacant look about it, stertorous breathing, nostrils dilated, muzzle dry, temperature 100°F, frequent micturition in small quantities, bowels normal, pulse quick, grinding of teeth, groaning and inability to get up.

Treatment:—Cold water was dashed to the head and the following mixture was given.

R_p

Liqr. Strychnine	3i
Caffeine citras	grs. XXXXV
Sugar	3iii
Aqua Chloroform	3vi

M. Ft. Mist, Sig. 1/3 part every two hours.

The following powder was given

R.

Mag. Sulph.	℥ii
Sodi Sulph	℥ii
Pot. Acetas	℥iv
Ammonium Chloride	℥iii

M. Ft. Pulv. ii Sig One in feed and in drinking water.

The urine cleared on the seventh day and the swelling on the fourth day. The animal slowly came back to normal and was brought out hunting on the 14th day.

TREATMENT OF MOIST ECZEMA BY SUBCUTANEOUS INJECTIONS OF STERILE COW'S MILK

BY

B. VENKATARATNAM, G.M.V.C.,
Veterinary Assistant Surgeon, Parvatipur.

Moist Eczema is a non-contagious skin disease affecting various regions of the body and is characterised by erythema and intense pruritis.

In the veterinary dispensary, Parvatipuram, 17 cases of this complaint were treated with sterile cow's milk injections and all of them were cured.

The following table gives the names of species treated and their ages:—

Species.	No. of cases.	Age				Remarks.
		Below 4 months	Between 4 to 6 months	Between 6 to 12 months	Above one year	
Bull calves	7	6	1	...	...
Heifer calves	5	4	...	...	1	
She buffalo calves	2	2	...	...	...
He buffalo calves	1	1	...	...	...
Dogs	2	...	1	1	...	

From the above table it can be seen that the complaint was chiefly among cattle under four months of age.

Symptoms.—There was inflammation and the formation of small vesicles which became confluent and caused the animal much irritation. Consequently the animal scratched violently and this resulted in the formation of red raw surfaces denuded of hair. The skin in some cases became thickened and wrinkled. There was also oozing of vesicular fluid but there was no formation of scabs or crusts. The parts affected were the inner aspect of the thigh, elbow, belly, inter-maxillary and perineal regions. The ventral aspect of the body (where the hair is sparse and delicate and the skin thin and sensitive) seems to be commonly affected. In most of the cases the lesions were confined to the inner aspect of the thighs and belly, but in a few cases the lesions were found extended to the elbows, inter-maxillary region and perineal region. Scrapings from all the 17 cases revealed no mange mites.

Treatment.—Before having recourse to treatment by milk injections two cases were treated at first with the application of mange-dressing; but even after five days no improvement was found. Then treatment by milk injections was taken up and with one injection marked improvement was found even after the very next day. There was blackening of the affected parts and gradual growth of hair. Complete cure was effected in five days. The majority of the cases were cured with one injection only while very bad cases required three injections for a complete cure. Milk injections were given subcutaneously at the rate of 15 c.c. for bovines and 5 c.c. for canines.

Details of animals treated, number of injections given and the time taken for cure are furnished in the table given below.

No. of animals treated	No. of injections per animal.	Time taken for cure.	Result.	Remarks.
12	1	5 days	Cured.	...
2	2	7 days	-do-	...
3	3	12 days	-do-	...

Preparation of the injection.—Milk from a healthy cow is taken and filtered into a sterile test tube. It is heated till it begins to boil. It is then cooled. The required quantity is taken and injected subcutaneously.

Advised the administration of strong coffee with sugar, gave Benzoin fumigation, warm clothing to the body and limbs after a good rub.

30-12-40. Animal slightly better, passed a few pellets of dung, urination increased, passed less frequently, pupils normal, but animal unable to stand or walk: when made to stand the calf fell. Temperature 101.0°F. Respiration and pulse improved. Prescribed the following mixture,

R_x

Caffeine citras	grs. XXX
Ammon. carb.	℥iii
Tr. Nux vomica	℥iii
Tr. Digitalis	℥i½
Tr. Scillae	℥iii
Infusion Thalachuruli	℥i½
Sugar	℥vi
Aqua chloroform	℥xii

M. Ft. Mist. Sig. ½ part thrice daily.

Mag. Sulph ℥iv, Ammonium chloride and Pot. Nitras each ℥ii was advised to be given in drinking water. Massage and warm clothing continued.

31-12-40. Animal better, ate a little grass, ruminated a little, urination better. There was still muscular weakness. Continued the mixture without caffeine citras and the powder in drinking water. The above treatment was continued for 3 more days.

3-1-41. Animal showed gradual and decided improvement, was able to walk about 100 yards, took food and ruminated. Mag. Sulph. ℥iv, Sodium chloride ℥i, Pulv. Ginger ℥ii, Treacle ℥vi was given in half a pint of water. Enema was given. Continued the mixture of 31-12-40 for another 3 days.

6-1-41. Animal decidedly better, more or less normal. Treatment stopped. Advised swimming for about 15 minutes daily.

10-1-41. Animal normal, declared cured.

Remarks:—There was extreme muscular weakness, probably due to central or peripheral nervous derangement, as in Palapoodu poisoning (please refer to the article already published, V.J. Vol. XVII No. 6) The infusion of Thalachuruli was found to be useful in the latter case. So I ventured to try that in tobacco poisoning also, where the symptoms to a certain extent were similar and the results of treatment seem to be encouraging, but it will require a few more trials to declare the efficacy of the juice of Thalachuruli in cases like this or allied ones.

Association News

THE CEYLON VETERINARY ASSOCIATION BRIEF HISTORY OF ITS FORMATION

The history of the veterinary services in the Island goes back to nearly fifty years. It began with the appointment of a Veterinary Surgeon to the Department of Public Instruction. Five years later, however, a separate department was formed and continued to exist as such till 1936 when it was absorbed into the Agricultural Department. Prior to 1931 two officers were recruited from England but, from 1931 to the end of its existence as a separate Department, it consisted of one officer recruited from England and the other assistant veterinary surgeons were trained and qualified in India.

The Colombo Municipal Veterinary Department began as a part of the Health Department. In 1906 it was converted into a separate Department with Mr. W. A. de Silva, now Minister of Health as its first Veterinary Surgeon. The Kandy Municipality has no separate Veterinary Department but appointed Mr. D. Seneviratne as its first veterinary officer. Incidentally it is amazing that neither the Municipality of Galle with a population of over 40,000 inhabitants, or any other U. C. in the Island, employ veterinary surgeons.

Though the veterinary service has been in existence for nearly half a century it has never had an Association. Two factors were mainly responsible for this. One was the smallness of their numbers and the other was the way the members of the profession were scattered throughout the Island. For instance so short a time as five years ago Colombo had only four private practitioners. Today there are well over a dozen members of the profession practising in the City. With the growth of their numbers the veterinary surgeons had for sometime felt the need for an influential Association which could espouse their cause and promote their science.

On a Sunday in May 1940, therefore, what might be called an "exploratory" meeting was held at the "Towers" Maradana of eight veterinarians. Besides Mr. R. J. Little, the Colombo Municipal Veterinary Surgeon, who presided, there were Messrs T. M. Z. Mahamooth, the Veterinary Research Officer, Department of Agriculture (representing the Government Veterinary officers) J. C. A. Prins, A. V. de Croos, C. A. Dias, L. P. P. Goonetilleke (Colombo Municipality) and L. A. P. Brito, Babapulle and Hector C. Perera (Private Practitioners.) The discussion lasted three hours and ultimately it was decided to take steps to form an Association. Mr. Hector C. Perera was

appointed Secretary pro tem, with instructions to circularise all the veterinary surgeons in the Island asking for their support and co-operation in the venture. Accordingly the following circular letter was despatched on the 27th June 1940.

Circular Letter, referred to,

Frankfort Place
Bambalapitiya
27th June 1940.

Dear Sir,

It is with pleasure that I address you this letter.

At an informal gathering of a few Veterinary Surgeons held recently, it was decided to form an All Ceylon Veterinary Association to safeguard the veterinary profession and to promote our science in Ceylon.

I do not think I need labour at length to explain the need for such an Association. When we look round we find every profession and trade having its Association to look after its own interests. But we veterinarians have nothing of the kind. To-day, the veterinary profession in Ceylon neither commands the respect of the public nor does it enjoy the same status as its allied professions — Medical and Dental. This is entirely due to our fault. In the past we have been a loosely scattered lot without an Association to ventilate our grievancees or a journal to espouse our cause. Today our members have increased with an unfortunate decrease in our privileges.

There never was the need for an Association as there is today. Unity is strength and we must now all band ourselves together to show our solidarity. This can best be achieved by forming an All Ceylon Veterinary Association of which we can all be members, irrespective of the positions we hold.

In view of these facts I hope you will give your earnest support and co-operation and enable us to form the Association. It has been decided, provisionally, to hold our inaugural meeting on Sunday the 28th July 1941. at 10 a.m. at the residence of Mr. L. A. P. Babapulle, M. R. C. V. S. at 19th Lane Colpetty, Colombo.

I shall be very grateful if you will kindly let me know without delay your views on the matter and any suggestions you might have to make.

Thanking you and anxiously looking forward to hearing from you soon.

Yours faithfully,
Hector C. Perera,
Secretary Pro. tem.

The response to the circular letter was very encouraging. Practically all the Veterinary Surgeons wrote back pledging their support. On the 23rd of July, the "Times of Ceylon" in a special article broke the news to the public that Veterinary Surgeons in the Island were going to form themselves into an Association. In the course of the article the paper said, "Immediate measures to check quackery by pseudo veterinary surgeons all over the Island are being taken by the Government whose representatives along with the Municipal authorities will meet on Sunday morning at the Municipal Veterinary Surgeon's Office at Maligakanda to form the Ceylon Veterinary Association, which will be the first colonial veterinary association to be organised. The Minister of Health has been invited to preside and the Governor and the Minister of Agriculture are also expected to be present."

The formation of such an association, it is felt cannot possibly be delayed any longer, in view of the safeguards that must be immediately enforced to stop the damage done by quacks all over the Island. The possession of half a dozen dogs, and a second hand drug counter, it is stated, seems to be all the qualifications needed to be a successful veterinary surgeon, particularly in rural areas. This unchecked malpractice, it is pointed out, has been one of the chief contributory causes of the spread of rabies. Several positive cases of rabies, have remained undetected, as these pseudo-veterinary surgeons have diagnosed and treated such cases attributing the ailment to some fictitious cause, extracting in the meanwhile the most exorbitant fees for their "professional services". When the animal eventually dies, the carcass is usually thrown in the dust-bin and is carried away by the street scavengers to the refuse destructor. The case of rabies remains undetected, no preventive measures are possible as a result and the menace goes on unchecked.

The Association which will be formed on Sunday will provide for the membership and registration of the qualified veterinary surgeons in the island, whose services alone will be available to the public."

The inaugural meeting then was held on the 28th July 1940 in the office of the Municipal Veterinary Surgeon, Colombo. More than half the number of veterinary surgeons in the Island were present, many having travelled from different parts of the Island to attend the meeting. The Hon'ble Mr. W. A. de Silva, Ceylon's Minister of Health and the first Ceylonese to qualify as a veterinary surgeon, presided. The Hon'ble Mr. D. S. Senanayake, Minister of Agriculture and Lands was also present.

After Mr. Hector C. Perera had read the notice calling the meeting Mr. W. A. de Silva addressed the meeting. The following account of the speeches and the proceedings is from the "Ceylon Daily News" of the 29th July 1940.

Two Objects

Mr. W. A. de Silva, the Minister of Health presided and in opening the proceedings expressed his pleasure at the decision of the veterinary surgeons to form an association. He remembered the time when there was only one qualified veterinary surgeon in Ceylon. They had now a fairly large number of them and it was their duty to do their best for the advancement of the science which they had been fortunate enough to study and to organise themselves into an association for two purposes. The first was the spread of knowledge regarding veterinary matters and the second, incidentally, was to look after the interests of the profession. They should, however, refrain from trying to make their association a trade union. They should not expect legislation to be introduced to prevent anybody else from treating an animal. That was not done anywhere in the world.

Much Work to do

Continuing, Mr. W. A. de Silva said that there was a great deal of work for a Veterinary Association to do. The Minister of Agriculture would be able to tell them that he had only a few officers trained in animal husbandry and that it was not possible to organise a comprehensive scheme for promoting animal husbandry in Ceylon.

"Millions of rupees worth of milk foods are imported into Ceylon annually, continued Mr. de Silva. But we have pasture land and cows, and proper steps should be taken to have our own milk supply and to obtain facilities to have the milk transported. It is for the Veterinary profession in conjunction with agricultural experts and instructors to investigate the problem. You have also to investigate the question of animal food. It is one of the most important matters that awaits attention in the Island. In olden times people had what might be called an instinctive knowledge, gained through the experience of ages, and their work will give you a clue to have some scientific data prepared so that those old ideas may be applied to advantage in modern times.

Knavery and Quackery.

Mr. R. J. Little, Municipal Veterinary Surgeon, in proposing the formation of the Ceylon Veterinary Association, said that it was the desire of the veterinary surgeons to ask the State Council to pass a bill for their registration in order to protect themselves and the public from knavery and quackery and to extend to them the privileges now enjoyed by other registered professional bodies. The Veterinary profession could by its knowledge of prevention of disease among animals be the corner stone of agriculture.

Mr. C. W. Pate seconded the resolution.

Producing More Milk

Mr. D. S. Senanayake, Minister of Agriculture, spoke of the benefits that the country could derive from such an association, and said that they were very fortunate in having as their Chairman that day the first Ceylonese Veterinary surgeon, who was also the Minister of Health. A few days ago, said Mr. Senanayake, he visited a health show at Mirigama. The Health Officer had spoken eloquently of how to bring up healthy children and build a healthy nation. He had asked them to start by taking milk and end by taking more milk. He (Mr. Senanayake) agreed with what the Health Officer had stated but there would not be the milk to start with and continue unless they succeeded in their activities. For the Minister of Health to succeed in building a healthy nation he must go back to his original love, the Veterinary profession. His presence there was an indication of the lively interest he continued to take in it.

Agriculture and animal husbandry had to go hand in hand. However much they might try to improve agriculture, unless animal husbandry was associated with it, there could not be any hope of success.

Mr. Senanayake continuing, said that he had full sympathy with the Association which was being formed because of the great task that lay ahead of it. They should consider that they belonged to a profession that was going to uplift the people of the country. They were unfortunate in Ceylon in another direction also. Ceylon students with brilliant qualifications obtained abroad started their careers in Ceylon with hopes of doing something for their profession and something for their country.

Importance of Research

"But what happened?" asked Mr. Senanayake. They are not encouraged to pursue their scientific studies. They never get an opportunity of doing any research. They are made to do routine work, that a clerk would do and we ask what do these people do? They have got their qualifications, but what have they done? Few people realise that it is not the individual but the system that is to blame. What I would like you to do is to get together not only for the exchange of ideas but also to obtain facilities to advance the scientific side of your profession." Mr. Senanayake continuing said that in the first place they had to husband the natural resources of the country and in the second they had to improve the live-stock. When both were ready he had not the slightest doubt there would be ample opportunity for the people to go back to the land and live comfortably. If they were able to give those people the land and give each family a small cottage and give them good cattle and poultry he was sure they would tackle the problem of unemployment and poverty.

Cattle Food

They had an idea that nothing was good enough for their people and animals to eat and they considered it necessary to import foodstuffs. Was it possible for them to import foodstuffs for their animals and make animal husbandry pay? His view was that they should take their food from the land in which they lived and make use of the waste products for the benefit of the animals.

The proposal to form an association was carried with acclamation and proceedings terminated with a vote of thanks to the two ministers proposed by Mr. L. A. P. Babapulle and seconded by Mr. L. P. P. Goonetilleke.

CEYLON VETERINARY ASSOCIATION FIRST ANNUAL REPORT

Report for the Period July 1940—May 1941.

Your Committee presents with pleasure the first Annual report.

Members

The number of members on the roll is 45. This figure is all but one of the total number of veterinary surgeons in the Island. It is gratifying to note that even those who have retired are keenly interested in the progress of the Association.

Meetings

Besides the first General Meeting no other general meetings were held. The Committee met four times. All the Committee Meetings were held in Colombo. The average attendance at these meetings was 10. It was very encouraging to find some of the outstation members coming down to Colombo regularly for the meetings.

Finances

The expenditure of the Association was rather high because of the initial expenses. A full statement of accounts is attached to this report.

Private Veterinary Institutes

The number of private veterinary institutes has grown in recent years, there being ten to-day. They are Mr. A. Chinniah's Veterinary Hospital at Green Path, Colpetty, Mr. P. M. Fernando's Establishment at Pelpola Kotahena, Mr. G. N. G. Walles, Racing Stables at Highcliff, Havelock

Town, Mr. M. Lawrence's Veterinary Dispensary at Galle Road, Colpetty, Mr. L. A. P. Babapulle's Veterinary Chambers at Colpetty, Mr. E. F. Edirisinghe's Racing Stables at Lake Crescent Road, Messrs Rupesinghe's and Ratnatunga's Veterinary Clinic at Reid Avenue, Mr. Hector C. Perera's Small Animal Surgery at 29 Frankfort Place, Bambalapitiya, Mr. G. H. de Saram's Veterinary Surgery at Ratnapura and the S. P. C. A. Veterinary Hospital at Baseline Road, where a qualified Veterinary Surgeon is employed. Up to last year there was only one Veterinary Surgeon who was a race horse trainer but since then there are two, the new trainer being Mr. E. F. Edirisinghe Jr.

Oversea Services

Two Ceylon Veterinary Surgeons are engaged in military service overseas. They are Mr. A. Amerasinghe, who is in the Burma Frontier Forces and Mr. S. Subramaniam in Quetta, India. We wish them all success.

Retired

Two members of the Association Mr. G. H. de Saram, Assistant Government Veterinary Surgeon, Ratnapura and Mr. G. B. de Silva, Assistant Government Veterinary Surgeon, Colombo, retired during the course of the year, after long and distinguished service under Government. This brings the total to three—Mr. M. de A. S. Wijenayake, having retired some time ago. We wish these members every happiness in the future and hope they will continue to take the same keen interest they have always taken in the Association.

Honoured

Mr. M. Crawford one of our Vice-Presidents and Deputy Director of Agriculture (Animal Husbandry) acted for the Director of Agriculture for a period of four months during the latter's absence from the Island. This is the first time that a Veterinary Surgeon has been the head of the Ceylon Agricultural Department. We record the distinction that befell Mr. Crawford with much pleasure.

Professional Papers

The following members of the Association contributed articles of professional interest to the journals and magazines stated below :—

- M. Crawford — (1) 'Coconut poonac as a Food for Livestock'—*Tropical Agriculturist*—Ceylon.
 (2) "The Polonnaruwa Farm"—"Daily News" Cattle supplement 1940.

- (3) "Should Cross Bred Bulls be used for Breeding"?
"Daily News" Cattle Supplement 1941.
- T.M.Z. Mahamooth—(1) "Artificial Insemination in Ceylon"—*"Tropical Agriculturist,"*—Ceylon.
- (2) "The Domestication of Farm Animals"—*"Journal of the School of Agriculture,"* Peradeniya.
- L. Rupesinghe — (1) "Clean Milk and How to produce it"—*"Anti Communist."*
- C. P. Pillai — (1) "The Veterinary Profession"—*"Journal of the School of Agriculture,"*—Peradeniya.
- J. C. A. Prins — (1) "The Veterinary Surgeon and Public Health"—*"Indian Veterinary Journal"* Madras.
- E. P. A. Fernando — (1) "A Successful Experiment in Hatching Eggs imported by Air Mail"—*"Tropical Agriculturist"* Ceylon.
- K. Thuraisingham — (1) "Gapes in Poultry"—*"Tropical Agriculturist."* Ceylon.
- L. A. P. Babapulle — "A Questionnaire on Rabies"—*"Times of eylon."*
- (2) "Milk"—*Social Justice.*
- (3) "Minerals in poultry Foods"—*"Journal of the Poultry Club."*—Ceylon.
- (4) "Milk Products"—*Social Justice.*
- (5) "Pasteurisation"—*Social Justice.*
- C. S. Leukay — "Farming in Denmark"—*Dinamina Cattle Supplement of 1941.*
- Hector C. Perera — "Amrita Mahal Cattle" in the *"Sunday Hindu,"* Madras.
- (2) "Rabies Menace"—*"Ceylon Daily News"*.
- (3) "Food Value of Milk"—*"Citizen," Journal of Colombo Municipal Service Union.*
- (4) "The Veterinary Serum Institute" Bangalore—*"Sunday Observer."*
- (5) "Indigenous Drugs in the Treatment of Livestock"—*"Indian Veterinary Journal,"* Madras.
- (6) "Dehorning of Cattle."—*"Ceylon Daily News" Cattle Supplement 1941.*
- (7) "Coconut Poonac as a food for Cattle"—*"Journal of Coconut Industriels,"*—Ceylon.

Rabies

One of the first questions that engaged the attention of your Committee was the problem of Rabies. Various methods were suggested to tackle the menace, from the raising and lowering of the dog tax, to the compulsory inoculation of dogs.

In view of the success that has attended the "one shot" method of prophylactic inoculation of dogs in other countries your Committee suggested that the Colombo Municipality should introduce this method as an experimental measure in the following resolution which was submitted to the Council.

"In view of the serious outbreak of Rabies in the City, the Committee of the Ceylon Veterinary Association request the Colombo Municipal Council to introduce immediately compulsory inoculation of all dogs in the City and urge that inoculation be given free of charge so that the full co-operation of the public may be ensured."

Proposed by Mr. D. Seneviratne.

Seconded by Mr. J. C. A. Prins.

It is the hope of your Committee that members of the Association will do their best with whatever means at their disposal to educate the public in this important Public Health problem. The world over Veterinary Surgeons are carrying on a ceaseless crusade against this scourge of humanity. It is their bounden duty to contribute their share to eradicate this most terrible disease.

Lecture

In the drive against Rabies launched by the profession — the first public lecture organised by the Association took place on the 16th of December 1940. Dr. L. Nicholls, Director of the Bacteriological Institute, delivered a very interesting and instructive lecture on "Rabies." The lecture was largely attended, those present including the Professors of the Medical and University Colleges. The Mayor of Colombo, Mr. A. E. Goonesinghe presided.

Assistance in case of Emergency

With a view of assisting the Government and the public in the event of an emergency arising from the war the following resolution was passed by your Committee :— "The Committee of the Ceylon Veterinary Association have much pleasure in placing at the disposal of the Government, in the event of an emergency, their professional services which might be needed

in any scheme of food inspection or in any scheme to safeguard the live-stock of the country."

Proposed by Mr. J. Habaragoda

Seconded by Mr. L. P. P. Goonetilleke.

The above resolution was forwarded to the Minister of Agriculture and Lands and acknowledged with thanks.

Cattle Breeding

Your Committee discussed at length the important part Veterinary Surgeons could play in any scheme of livestock improvement.

After a full discussion the following resolution on cattle breeding was passed : —

" In view of the growing demand for better cattle in the country and in the interests of better cattle breeding, the Committee of the Ceylon Veterinary Association appeals, to Government to introduce at an early date legislation to enforce the registration of all stud bulls in the country."

Proposed by Mr. Hector C. Perera

Seconded by Mr. T. M. Z. Mahamooth.

The above resolution was forwarded both to the Minister of Agriculture and the Cattle Breeders Association of Ceylon and acknowledged

Indigenous Drugs

Another matter that engaged the attention of your Committee was the question of Indigenous drugs in the treatment of livestock. With a view to formulate a workable scheme a sub-committee consisting of Messrs. J. Habaragoda, C. W. Pate, and Hector C. Perera was appointed to go into the matter.

Meat Inspection

This was another subject that was discussed by your Committee. Meat inspection has never received the attention it deserves from public health bodies. The deplorable state under which animals are slaughtered in certain parts of the country was viewed with deep concern. The President promised to draw up a scheme to be discussed at a future date by your Committee after which representations are to be made to Government for better meat inspection throughout the country. To-day proper meat inspection is carried out only in Colombo, Kandy and Nuwera Eliya.

S. P. C. A. and Cruelty Cases

It was the opinion of your Committee that the S. P. C. A. Hospital should be run by the Colombo Municipal Veterinary Department. It was also suggested that the Colombo Municipal Veterinary Surgeon be vested with magisterial power like those of the Principal of the Bombay Veterinary College, to try cruelty cases. By this it was thought that both the animal and its owner who is being prosecuted for cruelty, will have a fair and square deal.

More Veterinary Surgeons

Your Committee heartily endorse the plea for more Veterinary Surgeons made by the Director of Agriculture in the course of his articles to the "Ceylon Daily News" Cattle Supplement of 1941. "The States Veterinary Services must be considerably enlarged — at least to the Mysore level, as the country begins to show a desire for a higher standard of cattle breeding" says Mr. Edmund Rodrigo, Director of Agriculture.

There cannot be progress in agriculture without an efficient Island-wide Veterinary Service. The policy of retrenchment adopted by Government in regard to veterinary facilities is greatly to be deplored for it is not merely unwise and uneconomic but is definitely harmful to the country.

Appreciation

Your Committee wishes to place on record the valuable services rendered to the Association by its President and Mrs R. J. Little. Not only did Mr. and Mrs. Little allow the Committee the hospitality of their bungalow for several informal meetings but the President assisted the Association financially several times. Your Committee is very grateful to him and Mrs. Little for their generosity.

The keen interest shown by Messers. T. M. Z. Mahamooth and D. Seneviratne Municipal Veterinary Surgeon Kandy, is also appreciated by your Committee.

Your Committee also wishes to record the excellent work done by the Hony. Treasurer Mr. L. A. P. Babapulle. Not only was he responsible in collecting all the subscriptions, for which he had to go out of Colombo several times at his own expense, but he was of great assistance to the Committee in several ways.

Our thanks are also due to Mr. E. M. C. Babapulle B. Sc., A. C. A., Chartered Accountant for auditing our books free.

It is also with pleasure we convey our thanks to Mr. T. Crofton-Slegh a well wisher of the Association for having kindly drawn our crest.

Finally your Committee wishes to thank the local press and Dr. Srinivasa Rao, Editor of the Indian Veterinary Journal, for kindly giving the widest publicity to the activities of the Association.

No. 29, Frankfort Place,
Bambalapitiya,
Colombo.

HECTOR C. PERERA,
Hony. Secretary.

REPORT OF THE HONORARY TREASURER

Our financial year started on the 28th of July 1940, but for purposes of accounting it was assumed as having had its inception on the first of April. Subscriptions poured in apace and it was certainly an arduous task to get off the receipts in time.

We sincerely thank those members who were spirited enough to send us their subscriptions in advance, some for as long as three years prior to their being due. To their goodwill in implying the long and continued advancement of our Association we are truly grateful. With encouraging co-operation of so generous a nature the work of the Treasurer was indeed pleasant. Some members, unfortunately, were rather tardy in sending their dues, but I am glad to say that in almost every case a reminder was all that was necessary to elicit response. We must impress on our members that sending reminders mean utilisation of funds which could be better employed, and more profitably so, to the Association's progress. Every one of the forty five Veterinary Surgeons on our books has paid for this year under review.

For your kindness in the past, and for your continued support in the future, we express our thanks.

Abiglen,
Colombo.

L. A. P. BRITO-BABAPULLE,
Hon. Treasurer, C. V. A. 1940/41.

CEYLON VETERINARY ASSOCIATION

Income and Expenditure Account

(For the period 1st April 1940 to 31st March 1941.)

1941		1941		
March 31	To Postage	8-51	March 31 By Subs-	
" "	Stationery	53-25	criptions	220-50
" "	Advertising	40-00	" Donations	2-50
" "	Transfer to			
	B/s, Excess			
	of Income			
	over Expen-			
	diture.	120-74		
		<u>222-50</u>		<u>222-50</u>

Balance Sheet

(as at 31st March, 1941.)

<i>Liabilities</i>		<i>Assets.</i>	
Subscriptions paid in advance	20-00	Cash at Bank.	140-74
Capital:—			
Transfer from Inc. & Exp. A/c, Balance being excess of Income over Expenditure.	120-74.		
	<u>140 74</u>		<u>140 74</u>

Audited and found correct.

E. M. C. BABAPULLE
*Chartered Accountant.*L. A. P. BRITO-BABAPULLE
Hon. Treasurer C. V. A. 1940/41.

OFFICE-BEARERS FOR 1941-42

His Excellency Sir Andrew Caldecott, K.C.M.G., C.B.E. Governor of Ceylon (Invited).	} Patron.
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College News

MADRAS VETERINARY COLLEGE

The following Graduates have been selected for the post
Graduate Course during 1941-42 :—

- | | | |
|-------------------------------------|---|-----------------|
| 1. Mr. P. Ramachandran, G.M.V.C. | } | <i>Madras.</i> |
| 2. „ A. Sundara Rao Naidu, G.M.V.C. | | |
| 3. „ B. Hanumantha Rao, G.M.V.C. | | |
| 4. „ K. N. Krishnan, G.M.V.C. | | |
| 5. „ M. Parabrahma Rao, G.M.V.C. | | |
| 6. „ K. Mukunda Rao, G.M.V.C. | } | <i>F. M. S.</i> |
| 7. „ Cheah Phee Phay, G.M.V.C. | | |
-

Notice

Mr. M. S. Sastry, G. B. V. C., Treasurer, the All-India Veterinary Association, has now permanently settled at Bangalore after his retirement from service. All correspondence, etc., may be addressed to him to :—

Mr. M. S. Sastry, G. B. V. C.,
Treasurer, The All-India Veterinary Association,
149, Margosa Road, Malleswaram.
Malleswaram, P. O., Bangalore, (S, India).

Extracts

A SIMPLE AND PRACTICAL TEST FOR THE DIAGNOSIS OF OSTEOPOROSIS IN HORSES

BY

V. D. RATNAM, G.M., V.C.,

Veterinary Assistant Surgeon on Glanders Duty, Madras

(Received for publication on 27 June 1939)

The test was first invented by Dr. Akio Iizuko of Japan and subsequently tried by A. K. Gomus and Arcadio, C. Gonzagia, College of Veterinary Science, University of the Philippines. After seeing the article by the above-mentioned Philippine authors in the *Journal of American Veterinary Medical Association* for October 1938, the writer of this article tested 70 horses in H. E. the Governor's Bodyguard of Madras during the month of January 1939. As a result, he was able to detect 22 cases of Osteoporosis in an early and incipient stage of the disease without any clinical manifestations and also confirmed one advanced case of Osteoporosis showing clinical symptoms. The author of this article made an instrument consisting of a pointed iron needle measuring about 2 mm. in diameter and 2 cm. in length mounted on a wooden handle measuring about four inches in length with a diameter of $\frac{3}{4}$ inch. The test is applied by inserting the pointed needle with a steady and moderate pressure into the region over the frontal sinus. The proper point for inserting is near the middle of an



Fig. 1. Test for Osteoporosis



Fig. 2. Test for Osteoporosis

imaginary line drawn connecting the inner canthi of the eyes. If the case is a positive one, the needle can be inserted into the bone easily ; the animal keeps quiet without showing any symptoms of pain and the needle with its wooden handle stands perpendicular to the face as shown in Fig. 1. In negative cases, the needle cannot be inserted into the bone and the needle simply hangs on to the skin as shown in Fig. 2. The test should be applied on the left side of the median line but not on the right side, as it gives, at times, negative results even though the horse may be positive for Osteoporosis. The degree of softness of the bone can be very safely divided into two classes as (1) soft, (2) very soft. Out of 22 positive cases detected by this test, one was in advanced stage, showing clinical symptoms of Osteoporosis, while the other 21 horses did not show any clinical symptoms of Osteoporosis. Most of them, however, had been lame for some complaint or other. As recommended in the *Journal of American Veterinary Medical Association*, these positive cases were treated with one table-spoonful of calcium carbonate daily in feed for nearly two months. Along with this treatment, the Philippine authors recommend the subcutaneous and intravenous injections of colloidal magnesium hydrate 1 per cent solution from 50 to 100 c.c. to help the retention of calcium in the bones and to hasten the recovery. As this drug was not available anywhere in India, only calcium carbonate was tried for two months and then the animals which had given a positive test before were retested after two months. Ten cases gave complete negative results and in the remaining 12, the bone was not so very soft as it was before the treatment. These horses were aged and it was thought the absorption of calcium was very slow. The calcium treatment is therefore being continued for another two months for further observation. All the four young remounts gave negative test after the treatment. This shows that in young horses the recovery is quicker than in older ones.

CONCLUSION

It is the opinion of the writer of this article that Osteoporosis is fairly common in horses in Madras and that a horse should be tested at least twice or thrice in a year so that the disease can be detected in its early stage and treated successfully. The test is based upon the observation that the bones of the skull, particularly the frontal bones, are the parts of the skeleton which are affected first. This simple test is harmless and can be very easily performed periodically on all horses in a stable to pick out animals which are in need of calcium treatment. This will arrest further progress of the disease.

I. J. V. S and A. H. Vol X, No 1., 1940

The Immunizing Value of the Blood Clot of Hyperimmunized Animals

When an animal is bled and the serum is allowed to decant the proportion of serum obtained varies between 40 and 50 per cent according to the species of animal and the method of separating it. The clot contains red and white blood cells and also a certain quantity of serum that may be worth considering. Moreover, relatively recent experiments have shown that the red cells possess the property of absorbing virus, bacteria and antigens circulating in the blood¹. In the attempt to obtain more of the

specific serum against canine distemper (Carre's disease) the authors tried to verify in the cadre of that disease, the power the red cells have in absorbing the specific antibodies.

Recently two Russian authors, P. A. Boulanov and V. Rikowsky, assuming that the body has the capacity of producing antibodies only through cells of mesoblastic origin and that it is possible that they (antibodies) formed in the figures elements of the blood as well as in other cells of the same origin, attempted to obtain a liquid from the blood cells possessing the properties of antiserum and capable of replacing it. To obtain this liquid the authors used the blood of horses hyperimmunized against anthrax. The blood of these animals was kept in flasks at room temperature until separation of the serum was complete. The serum was then aspirated and mixed with 3 per cent phenol. The coagulum remaining was shaken energetically for 15 minutes in the same flasks whereupon physiological salt solution was added. To facilitate extraction the flasks were left at room temperature for 24 hours, filtered through gauze and Berkefield bougie, and conserved like serum with a solution of 3 per cent phenol.

The titration was effected on rabbits. The authors concluded :—

1. The blood clots prepared from the blood of an animal immunized against anthrax possesses immunizing properties ;
2. the liquid is no less active than the serum ;
3. the preparation of such a liquid reduces the production expense and augments the amount produced.

Based upon these experiments, the authors attempted to obtain from red blood cells (which are thrown away in the preparation of specific serums), an immunizing liquid against canine distemper.

Preparation of the Extract.—Dogs hyperimmunized in the usual manner were used. The serum was collected by decantation. The clot remaining in the flask was mixed with physiological salt solution amounting to one half of the quantity of the serum removed. The mixture was energetically stirred and shaken and left 24 hours in the refrigerator. This liquid obtained by centrifuging is limpid red. It was then formulated (1%) and incubated at 56°C. for two days.

Titration on Ferrets.—One ferret resisted 1 mg. of virus after receiving 1 mg. of the blood-cell extract ; 1 ferret died of 10 mg. of virus after receiving 1 cc. of the extract ; 1 ferret resisted 10 mg. of virus after receiving 2 cc. of the extract : 1 ferret resisted 2 mg. of the virus after receiving 1 cc. of the extract ; and 1 ferret died of 2 mg. of virus after receiving 1 cc. of the extract.

As is customary in the titration of specific serums the doses in these experiments were 1,000 to 10,000 times the minimum mortal doses. The results were, therefore, excellent.

The Practical Results.—Tests of the therapeutic value of such products have been made on dogs affected with the natural disease, at the Alfort clinic, during the months of September and October, 1936. Symptomatic

treatment, except in several cases, was not neglected. The dose of the red-cell extract was 20 cc: 10 cc. subcutaneously and 10 cc. intramuscularly at the thigh. The animals were examined two to three days after receiving the injection and the results checked again after a month or two.

(The authors tabulate the result in 23 cases).

Of 23 cases treated 16 recovered and 7 died. Of the latter 2 were sacrificed before the results could be judged. Of the 16 recoveries, two were rapid and occurred without any symptomatic medication. In general when employed early, the extract provoked early amelioration. The authors do not claim that the blood-cell extract is superior or even quite as effective as the serum-alone product.

Journal of the AVMA., February, 1941.

Stiff Lamb Disease (Aphosphorosis).

Since pronounced similarity was observed in the appearance of the skeletal muscles in stiff lamb disease and the same entity in calves, affected lambs were treated with phosphoric acid. In stiff calf disease, blood samples from the dams (cows) showed inorganic phosphorus deficiency, and the calves exhibited stiffness, muscular weakness, paresis and emaciation, with death ensuing. *Post mortem* the skeletal muscles were pale, pinkish gray. When bone meal was fed to the cows and phosphoric acid to the calves, there were no further losses.

Stiff lamb disease was studied in a flock of 20 ewes, purchased in poor condition in the fall and wintered on hay and mangels with grain ration fed two weeks before lambing. The lambs were 3 weeks old when the flock was turned to pasture. In three or four days several of the lambs were stiff and in a week twelve were affected.

Given a desertspoonful of dilute phosphoric acid twice a day for three days and then a teaspoonful twice a day for the remainder of the week, the lambs recovered in two weeks. One lamb badly stricken died of pneumonia after showing some improvement in locomotion.

Blood samples of the ewes showed that the phosphorus content ranged from 3.57 to 6.80 mg. per cent and of the lambs 5.88 to 9.0 mg. per cent. (F. W. Sohofield and A. F. Bain. Stiff Lamb Disease—An Aphosphorosis. Report of the Ontario Veterinary College, 1939), p. 19).

Journal of the AVMA., February 1941.

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THE
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Vol. XVIII

SEPTEMBER 1941

No. 2

General Articles

EXPERIMENT IN TRYPANOSOMA EVANSI

BY

A. R. KUPPUSWAMY, G.B.V.C., F.G., (Mad.),
Assistant Veterinary Officer, Penang.

In 1841 Valentine of Berne discovered a *Trypanosoma* in the blood of a trout, and since then innumerable species of these flagellates have been encountered in the blood and tissues of birds, beasts and fishes. As a rule these parasites are specific to a particular host, but innocuous to it. There are others, however, which are pathogenic but apparently harmless to their usual host, which in course of time have developed a tolerance to them. When, however, these *Trypanosomes* are transferred to unusual hosts they may become exalted in virulence and give rise to serious disease. Animals which are suffering from this latent form of infection, being apparently healthy and able to travel, are a source of danger when moved from an area where *Trypanosomiasis* is endemic to another, where infection may be transmitted to more susceptible hosts. In this way, during recent years *Trypanosomiasis* has been widely disseminated.

Surra having been introduced from French Indo-China to Thailand, is threatening over 3 million cattle and buffaloes with extermination. (Bevan, *Veterinary Journal* - October, 1937).

Up to 1931 British Malaya had been importing, in unrestricted numbers, oxen and buffaloes for the vast meat-consuming population from Thailand. The writer is of opinion that *Trypanosomiasis* was introduced into Malaya by these Thailand cattle. The first case of *Trypanosomiasis* (in a pony) was reported in 1903 by Ford. The death of 43 ponies investigated by Moir (1905), was attributed to Surra. In 1907, cases of *Trypanosomiasis* occurred in horses at Penang and Province Wellesley. Fraser and

Symonds have also come across in Malaya, Thailand cattle naturally affected with *T. evansi* (imported animals). At present cattle from Thailand are imported under restriction, and these animals are required only for meat. Such imported animals are kept in the Government Cattle Quarantine Station, until required for slaughter, from where they are taken direct to the slaughter houses.

In 1934, six cases of Trypanosomiasis (*T. evansi*) in horses were detected in Pahang and one case in dog in Perak.

In 1935, Trypanosomiasis was seen in four dogs at Taiping. In Selangor a solitary case of canine Trypanosomiasis was reported, and seven cases were reported in Pahang in dogs.

During 1937, canine Trypanosomiasis occurred in Pahang. In Perak there were two sporadic cases. Trypanosomiasis in Kedah was diagnosed in six buffaloes and three dogs. The peripheral circulation of a Thailand buffalo in Penang showed *T. evansi*.

In 1938, five cases of Trypanosomiasis in dogs and two cattle were found in Perak. Three cases (in buffaloes) were detected in Kedah and one case in an imported Sindhi bull in Seremban.

Wenyon is of opinion that the goats usually shake off the infection in about six months' time, by which time auto-sterilisation is said to have taken place.

The writer experimentally infected various animals with the object of determining (1) the period when auto-sterilisation takes place in the goat, and (2) the species of animals that are susceptible to infection, and (3) the species that succumb to it.

A batch of 42 buffaloes and 24 oxen from Siam were imported into Penang on 5-10-1937 for slaughter. Blood smears were prepared from all animals which showed any rise in temperature.

On 9-10-1937 *T. evansi* were found in blood taken from one of these buffaloes (Micro-photo No. 1). This buffalo (No. 25) showed only a slight rise of temperature (102.2° F.). *T. evansi* could not be seen in its blood on subsequent examinations.

On 26-10-1937 although no *T. evansi* were actually seen in smears, 4 c.cs. of blood from the auricular vein of this buffalo together with 1 c.c. of Sodium Citrate solution were injected into guinea pig (No. 1). The buffalo showed no sign of ill-health and fed normally until eventually sent for slaughter. Smears from the lungs, heart, liver, spleen and kidneys of the buffalo all proved negative.

On 19-11-1937 an apparently healthy local goat was inoculated with 4 c.cs. of heart blood from guinea pig No. 1, while the latter was showing *T. evansi* in its blood. The goat became infected, *T. evansi* appearing in its blood three days after inoculation.

On 12-9-1938 a healthy calf was inoculated with the blood from the infected goat.

The blood from the goat and the calf was later used in a series of experiments in inoculating 14 guinea pigs, 2 cats, 10 dogs and 2 pigs.

The attached Table I shows the dates upon which infection could be seen on microscopic examination, and the results therefrom.

The results of the experiments are as follows :—

One pig became emaciated and eventually died without showing infection; 14 guinea pigs, one calf and eight dogs contracted the disease, and all became emaciated and died.

Dog No. 9 failed to be infected and was destroyed on 3-1-1940.

The experimental goat is still alive and kept under observation.

Dog No. 10 was not infected and was destroyed on 18-3-1940.

Cat No. 2 which was inoculated with blood taken from the dead calf failed to take the infection.

Pig. No. 2 has not taken the infection and was under observation until 1-6-1940 when it was sold for breeding purposes.

Although *T. evansi* could not be seen in smears prepared from peripheral blood, yet when the blood was injected into these experimental animals the condition was set up, and *T. evansi* demonstrated in blood smears prepared from them, due to the low concentration of trypanosomes in the blood of the infected animals.

Blood smears prepared at post-mortem examinations showed *T. evansi* only when the terminal condition was septicaemia.

When trypanosomes were not seen in the peripheral blood, blood smears prepared from the internal organs also proved negative.

Morphology of *Trypanosoma evansi*

These were stained with Giemsa, Leishman's and Panoptic. The last named stain gave the best results. The Trypanosomes possessed a long free flagellum which is said to be characteristic of *T. evansi*, and also the centrally placed nucleus. The Kinetoplast was quite distinct. The posterior extremity is like a drawn out tube and the Kinetoplast is situated in this tube. The flagellum starts from this Kinetoplast and ends in a long free flagellum after developing a marked undulating membrane with manifolds.

Trypanosoma evansi has a large centrally placed nucleus which plays a vital part and can be compared to the brain of vertebrates as it controls all the functions of the organism. There is also a small mass of shining chromatin called the Kinetoplast or centrosome situated in the drawn out tube

of the posterior end of the parasite. This is mainly concerned with the reproduction and locomotion of the parasite.

The long flagellum which takes its origin from the Kinetoplast and ends anteriorly into a whip-like process is called the axoneme when bordering the undulating membrane. The free flagellum and the undulating membrane could be compared in function to the fins of the fish and it is to these that the snake-like movements of the parasites are due.

In the protoplasm of the body are granules called "Volutin materials" which have the function of food materials.

Dividing and Giant Trypanosomes were seen from the blood smears of the following animals :—

Buffalo No. 26, Guinea pigs No. 1 and No. 5.

The measurements of 50 Trypanosomes showed the following :—

Longest :	25.2 microns	X 2	microns.
Shortest :	18.0	„ X 1.5	„
Average :	24.2	„ X 1.8	„

Adhesion of Platelets and Agglomeration of Trypanosomes

This phenomenon was successfully demonstrated on guinea pig No. 1 on 10-12-1937 (Micro-photo No. 2). The serum used was drawn from the experimental goat on 8-12-1937. This test was carried out with success on the blood of guinea pig No. 5 on 17-12-1937. (Micro-photo No. 3).

Another test was made on 26-4-1938 from the blood of guinea pig No. 9 (Antigen), and serum from the experimental goat drawn on 2-12-1937 (Micro-photo No. 5). The same phenomenon was carried out from the blood of the experimental dog No. 1 (Micro-photo No. 4).

Also same test was performed on 30-1-1939 from the blood of the experimental dog No. 3 and serum (anti-sera) from the experimental goat drawn on 21-1-1939 (Micro-photo No. 6).

On 21st, 22nd, 23rd and 25th of May, 1939, Agglomeration Tests with the blood of Dog No. 6 (Antigen) and the serum of the experimental goat (Anti-serum) were again carried out successfully (Micro-photo No. 7).

Hanging drop method was adopted on all these occasions, and perfect Rosette formation of live trips were seen formed within a minute after mixture of the serum and blood.

The posterior parts of the trips were found together in regular formation with the anterior and radiating free in the serum.

The phenomenon can only be demonstrated when there are about 60 trips to the field. (Oil immersion lens 1/12" in wet blood smears).

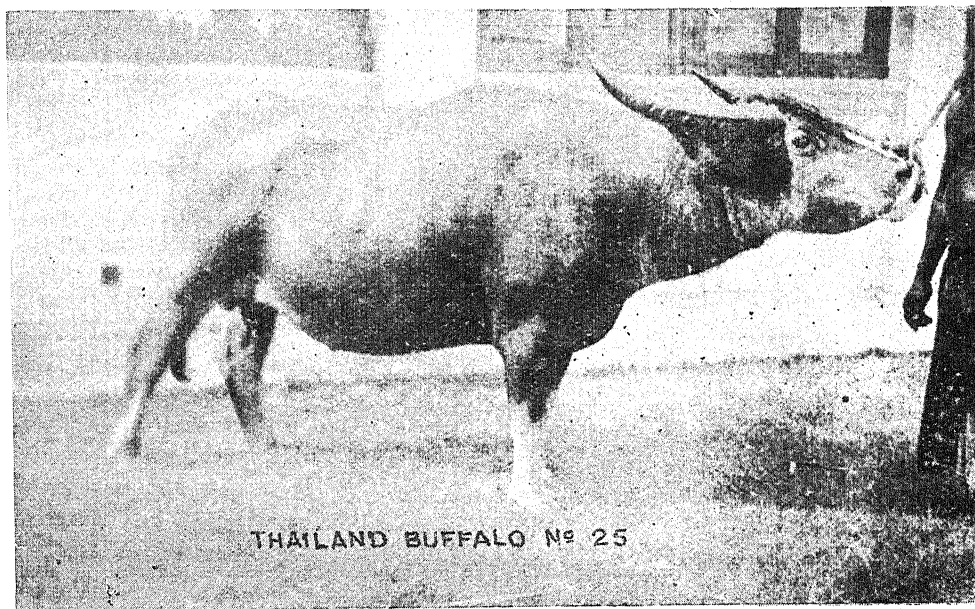


Fig. 1. Photo of Thailand Buffalo.

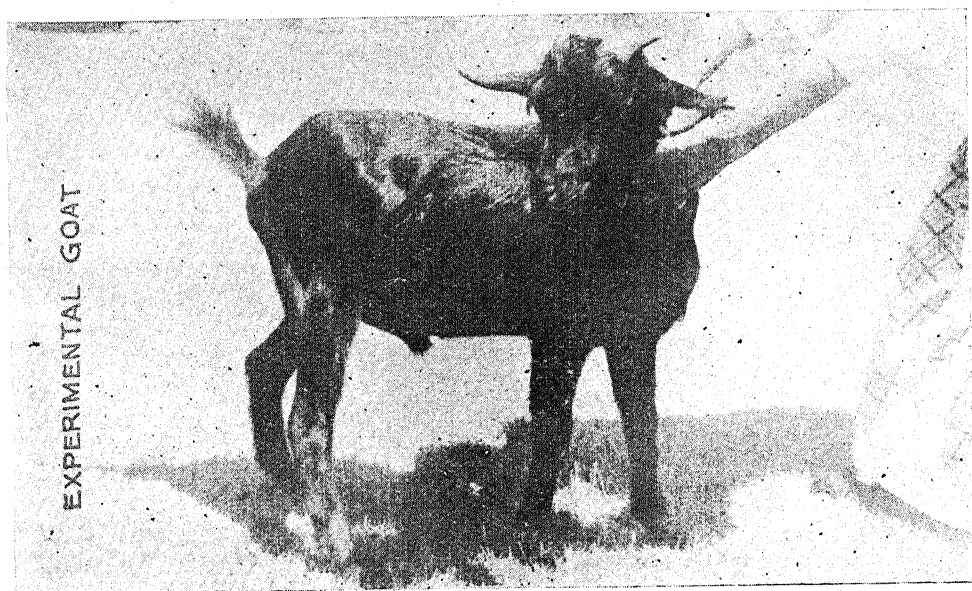


Fig. 2. Photo of Experimental Goat.

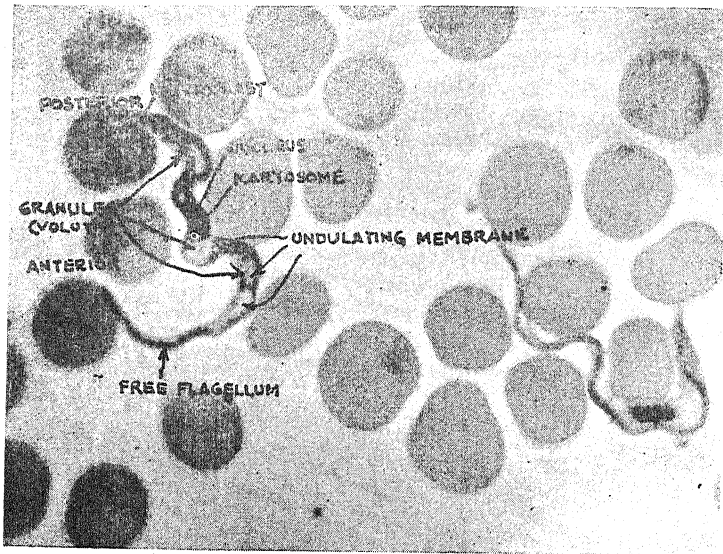


Fig. 3. Micro-photo of *T. evansi*.

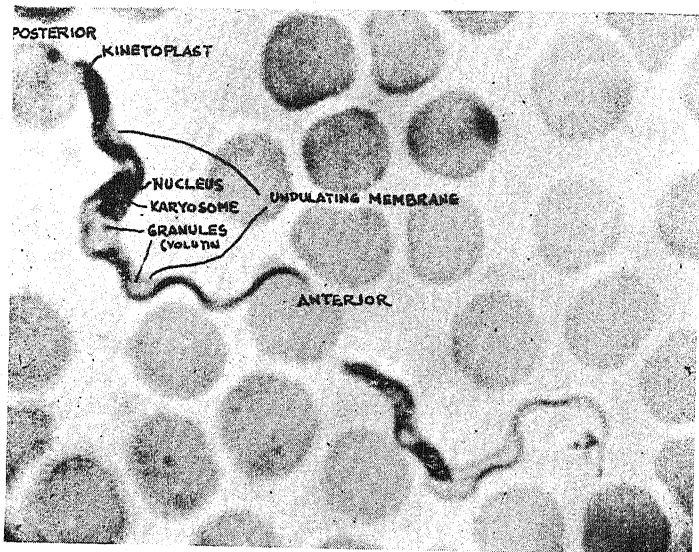


Fig. 4. Micro-photo of *T. evansi*.

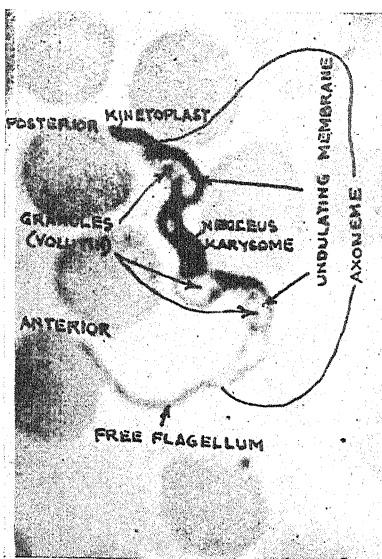


Fig. 5. Micro-photo of *T. evansi*.

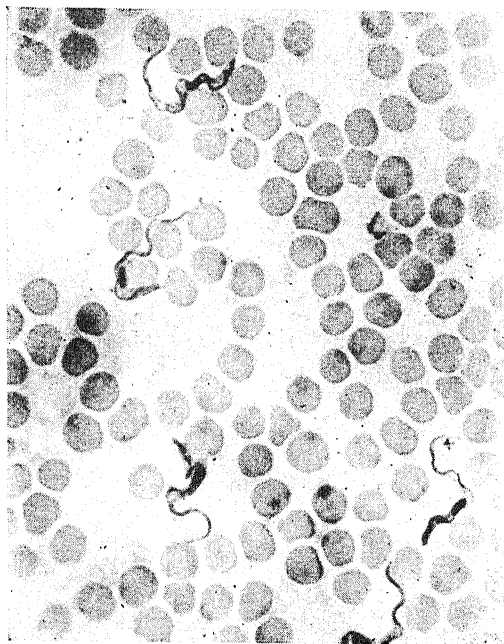


Fig. 6. Micro-photo No. 1.

Blood smears from Thailand Buffalo No. 25. 9-10-37 (1½" Oil Immersion Lens)

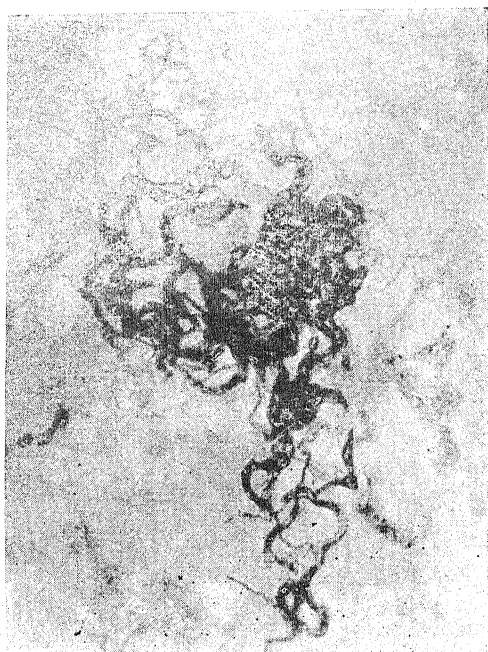


Fig. 7. Micro-photo No. 2. Agglomeration test (Blood containing *T. evansi* from Experimental Guinea-Pig No. 1, mixed with Anti-Serum from Experimental Goat). 10-12-1937. (1/12" Oil Immersion Lens).

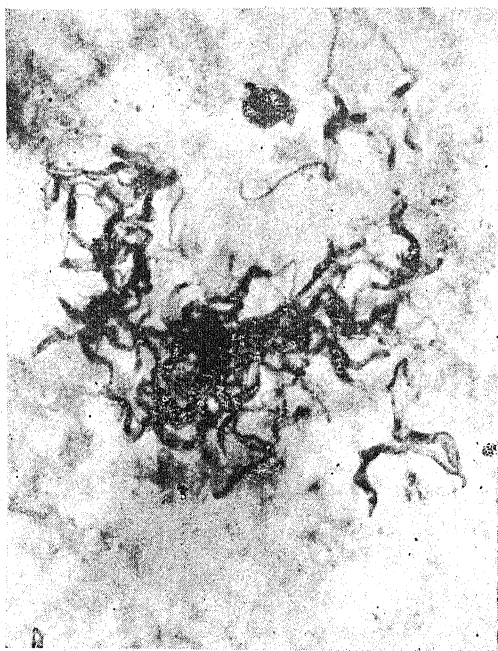


Fig. 8. Micro-photo No. 3. Agglomeration test (Blood containing *T. evansi* from Guinea Pig No. 5, mixed with Anti-Serum from Experimental Goat) 17-12-1937. (1/12" Oil Immersion Lens).

Mercuric Chloride Test

This test was carried out on several occasions on the experimental animals. One drop of serum was added to 1 c.c. of a solution of 1/25,000 Perchloride of Mercury.

The Mercuric Chloride Test was found to be of doubtful value, as at times positive results were obtained and at times negative, when successful blood inoculations were made into susceptible animals. (Please vide Table II).

The Mercuric Chloride Test was tried with the serum of the experimentally infected goat on 6-2-1938 and on 8-3-1938 with positive results; and on the 1st, 9th, 14th and 22nd April, 1938, with negative results.

Since February 1938, positive results were obtained up to March 1938, after which the results have been negative; yet the blood from each of these animals proved infective when inoculated into other susceptible animals: hence the Mercuric Chloride Test appears to be of doubtful value.

Serum from the affected guinea pigs were all negative to this test.

Formal-Gul Test

Formal-Gul Test was also carried out and this too failed to give satisfactory results, as in the case of the Mercuric Chloride Test. (Please vide Table III).

On 22-11-1938 blood was drawn from the infected goat and calf, and the serum obtained was kept in two small sterile bottles and placed in an ice chest. The test was applied on 13th December 1938 to the serum of both animals. A positive result was obtained with the serum of the goat, while a negative result was obtained with the serum of the calf. The strength of the dilution was 1 c.c. of serum to 1 drop (0.05 c.c.) of commercial formalin.

On 17-12-1938 blood was again drawn from the goat and calf. A similar test was applied to the sera of these animals on the same day; but this time the calf's serum was positive while that of the goat was negative, yet the blood from each of these animals proved infective when inoculated into other susceptible animals; hence the Formal-Gul Test appears to be of doubtful value.

Viability of Trips

Some wet smears (unstained) were sealed in vasaline and compared with unsealed (unstained) smears, and it was noted that in the sealed films the parasites lived for about $5\frac{1}{2}$ hours as against $3\frac{1}{2}$ hours in the case of the unsealed. (Room temperature from 79° to 81°F.)

Culture

Efforts to grow *T. evansi* in N.N.D. media in an incubator as well as in refrigerator did not meet with success.

Treatment

Several drugs as Naganol, Antimosan, Tartar Emetic, Atoxyl, Mercuric Chloride, Tryparsamide, etc., are being tried in several countries in the treatment and control of Trypanosomiasis. Excellent results are claimed by the use of Naganol (Bayer 205) and varying results with the other above-mentioned drugs.

A batch of 26 oxen and 64 buffaloes arrived from Thailand on 4-6-1940 for slaughter in Penang. At 7 a. m. on 11-6-1940 one of the buffaloes (age 6 years) No. 26 was seen lying on the floor with all the visible mucous membranes injected, locked jaw, eyes blood shot, stiff legs which could be bent with difficulty, dyspnoea and it was salivating. Temperature was 99.8° F. At no time did the temperature exceed 102.4°F. The bowels were costive and covered with blood and mucus. Wet blood films showed heavy infection with Trypanosomes. Intravenous injection of Tartar emetic (40 c. cs of a 10% solution) was given to this animal on 11th, 12th, 17th, 20th, and 25th June, 1940. Few Trypanosomes were seen on 17th, 24th, and 25th. On 12th June, the animal was in a state of stupor, eyes half-closed and salivating profusely. On 13th, the animal was able to stand, but was constantly moving its head from side to side. On 14th the animal was going round and round in a circle and stumbled over obstacles as if the animal was blind. All these days the animal was watered and fed by force. From 17th onwards the animal started masticating and drinking water of its own accord.

As no Trypanosomes were seen from the 26th June onwards and the animal picked up condition rapidly, it was sent for slaughter for meat on 1st July, 1940

Wet and dry smears taken from the spleen, brain vessels, liver, lungs, kidneys and heart of the animal failed to reveal Trypanosomes.

All the organs appeared normal except there was a good deal of pericardial fluid and the flesh was of a darker colour than normal.

Conclusion

(1) The passage of *T. evansi* through a goat does not seem to attenuate its virulence as inoculations with this passaged strain produced fatal results in 8 dogs, 14 guinea pigs, 1 calf and 1 cat, only the last 2 dogs out of the 10 inoculated surviving.

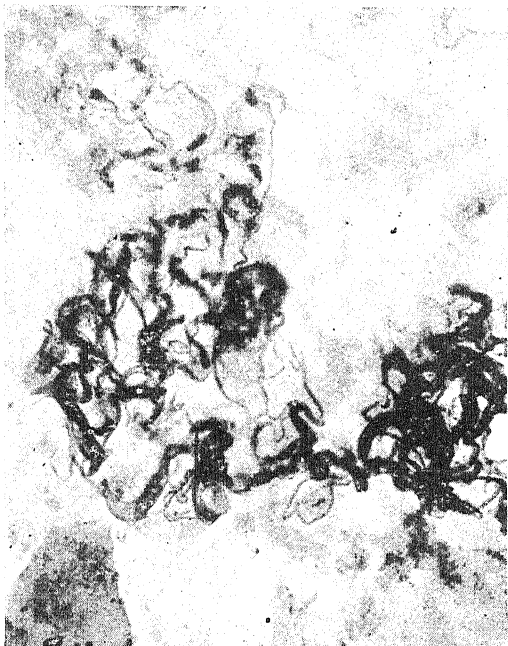


Fig. 9. Micro-photo No. 4. Agglomeration test (Blood containing *T. evansi* from Experimental Dog No. 1, mixed with Anti-Serum from Experimental Goat). 17-12-1937. (1/12 Oil Immersion Lens).

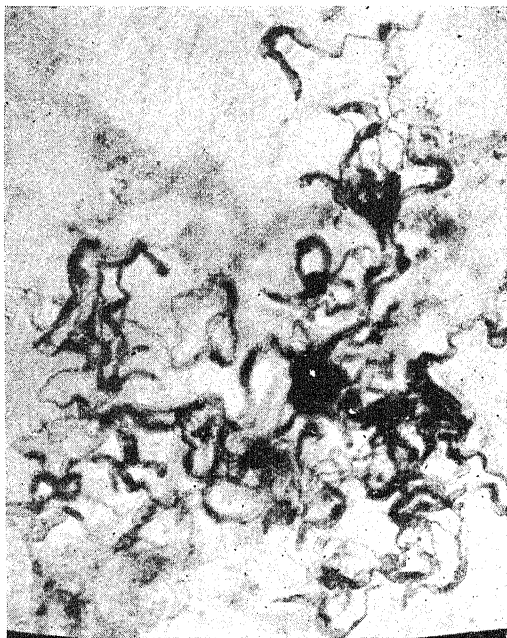


Fig. 10. Micro-photo No. 5. Agglomeration test (Blood containing *T. evansi* from Experimental Guinea Pig. No. 9, mixed with Anti-Serum from Experimental Goat). 26-4-1938 (1/12'' Oil Immersion Lens).

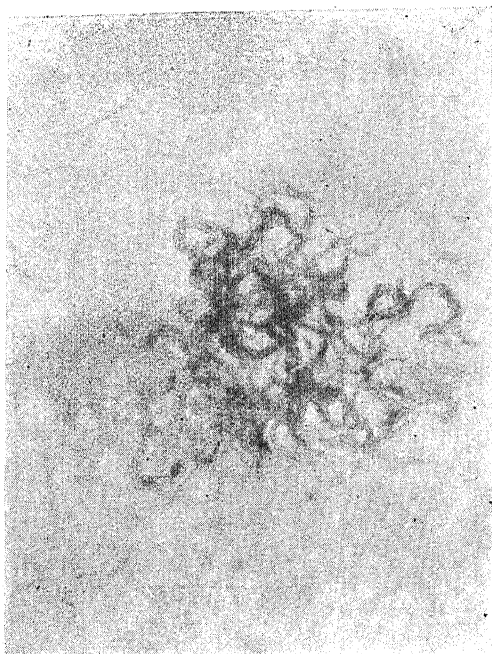


Fig. 11. Micro-photo No. 6. Agglomeration test (Blood containing *T. evansi* from Experimental Dog No. 3, mixed with Anti-Serum from Experimental Goat) 30-1-1939. (1/19" Oil Immersion Lens).

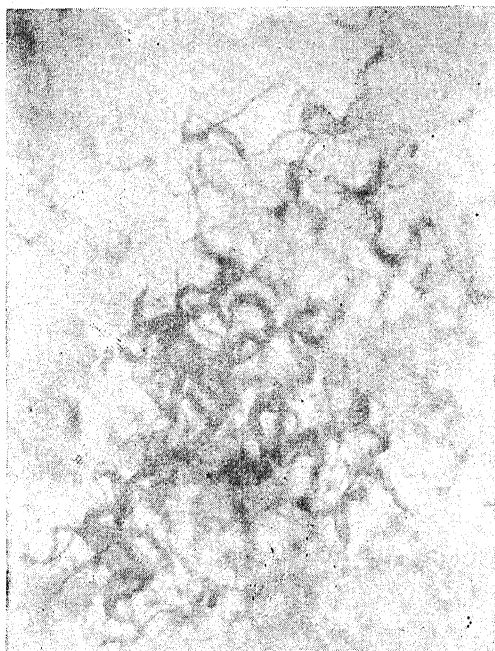


Fig. 12. Micro-photo No. 7. Agglomeration test (Blood containing *T. evansi* from Experimental Dog No. 6, mixed with Anti-Serum from Experimental Goat). 23-5-1939. (1/12" Oil Immersion Lens).

(2) The Goat in this experiment has remained infective for a year, 8 months and 20 days; hence auto-sterilisation does not take place at least in every case in 6 months time as is generally believed to be and supported by Wenyon.

Since only one goat was experimented with, the results cannot be said to be conclusive.

(3) In addition to cattle, goats must also be considered reservoirs of *Trypanosoma evansi*.

(4) The writer failed to infect 2 pigs although Baldry (1910) says that pigs are susceptible and may be infective to other animals.

(5) Mercuric Chloride and Formal-Gul Tests, are of doubtful value when applied to the goat and calf, at least that has been our experience in this series of experiments.

Acknowledgements

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2. I am also indebted to the Government Pathologist, Penang, and his staff for assistance rendered in this experiment.
3. I acknowledge with pleasure the assistance rendered by Mr. Yeoh Hoe Peng, Chinese Livestock Inspector, Penang.

REFERENCES

1. Protozoology by C. M. Wenyon.
2. Surra in the Federated Malay States by Fraser, H and Symonds, S. K.
3. Trypanosomes and Trypanosomiasis by Lavern and Mesnil.
4. Some Observations on the Trypanosomes of Cattle in South India by M. Anant Narayan Rao and S. Vaidyanatha Mudaliar,

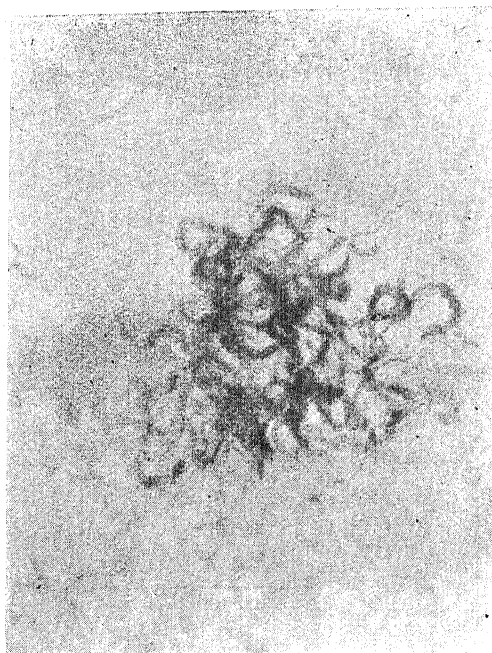


Fig. 11. Micro-photo No. 6. Agglomeration test (Blood containing *T. evansi* from Experimental Dog No. 3, mixed with Anti-Serum from Experimental Goat) 30-1-1939. (1/19" Oil Immersion Lens).

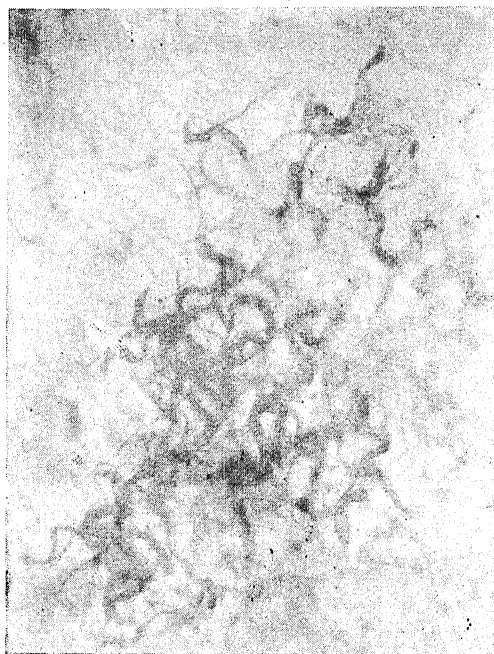


Fig. 12. Micro-photo No. 7. Agglomeration test (Blood containing *T. evansi* from Experimental Dog No. 6, mixed with Anti-Serum from Experimental Goat). 23-5-1939. (1/12" Oil Immersion Lens).

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4. Some Observations on the Trypanosomes of Cattle in South India by M. Anant Narayan Rao and S. Vaidyanatha Mudaliar,

TABLE I. EXPERIMENT IN TRYPAÑOSOMA EVANSI SHOWING
The Mode of Transmission and Results on Various Animals Used.

Donors	Recipients	Inoculated on	How Inoculated	Amount of blood	From	When Infected after Inoculation	Remarks	Duration of Disease
A. Buff. No. 25	G. Pig No. 1	26-10-37	Intra-peritoneally	4 c.es.	Auricular vein	6-11-37 (11 days)	Died on 11-12-37	47 days
B. G. Pig No. 1 do	Goat No. 1	19-11-37	Subcutaneously	4 c.es.	Heart blood	22-11-37 (3 days)	Still kept under observation Developed paraplegia Destroyed on 31-12-37	34 days
	G. Pig No. 4	28-11-37	Intra-peritoneally	5 c.es.	do	1-12-37 (3 days)		
C. Goat No. 1 do do do do do do do do do do do do do do	G. Pig No. 5	8-12-37	do	3 c.es.	Jugular vein	15-12-37 (7 days)	Died on 31-12-37	24 "
	G. Pig No. 8	29-1-37	do	3 c.es.	do	28-2-38 (30 days)	Died on 29-3-38	60 "
	G. Pig No. 9	7-3-38	do	3 c.es.	do	15-3-38 (8 days)	Died on 11-5-38	66 "
	G. Pig No. 10	26-4-38	do	5 c.es.	do	7-7-38 (72 days)	Developed paraplegia on 15-7-38. Died on 16-7-38	82 "
	G. Pig No. 11	9-7-38	do	3 c.es.	do	Not infected	Died of pneumonia on 16-7-38	—
	G. Pig No. 12	6-8-38	do	3 c.es.	do	18-8-38 (12 days)	Died on 9-9-38	35 "
	G. Pig No. 13	12-9-38	do	3 c.es.	do	Not infected	Died of pneumonia on 26-9-38	—
	Calf No. 1	12-9-38	Subcutaneously	7 c.es.	do	26-9-38 (14 days)	Died on 30-12-38	110 "
	Dog No. 1	24-10-38	do	3 c.es.	do	9-11-38 (16 days)	Died on 5-12-38	43 "
	Pig No. 1	1-11-38	do	10 c.es.	do	Not infected	Died of pneumonia on 28-11-38	—
	Dog No. 2	1-11-38	do	5 c.es.	do	10-11-38 (9 days)	Died on 2-12-38	32 "
	G. Pig No. 14	7-11-38	Intra-peritoneally	3 c.es.	do	18-11-38 (11 days)	Died on 21-11-38	15 days
	Cat No. 1	22-11-38	Subcutaneously	5 c.es.	do	12-12-38 (19 days)	Died of Septicemia on 4-4-39	134 "
	G. Pig No. 15	13-12-38	Intra-peritoneally	5 c.es.	do	25-12-38 (12 days)	Died on 7-1-39	26 days

do	Dog No. 3	17-12-38	Subcutaneously	5 c.es.	do	27-12-38 (10 days)	44
do	Pig No. 2	6-2-39	do	5 c.es.	do	Not infected	—
do	Dog No. 5	6-2-39	do	5 c.es.	do	23-2-39 (17 days)	64 days
do	Dog No. 6	15-4-39	do	5 c.es.	do	Died of Septicæmia on 10-4-39	43
do	Dog No. 7	23-6-39	do	5 c.es.	do	Died on 27-5-39	—
do	Dog No. 8	26-8-39	do	5 c.es.	do	Died of Septicæmia. Found dead on 6-8-39	45
do	Dog No. 9	26-10-39	do	5 c.es.	do	Died of Septicæmia. Found dead on 23-10-39	59
do	Dog No. 10	3-1-40	do	10 c.es.	do	Destroyed on 3-1-40	—
						(Kept under observation until 18-3-40, when it was destroyed.	
D. Calf No. 1	G. Pig No. 16	13-12-38	Intra-peritoneally	5 c.es.	do	Died on 4-1-39	23
— do	Dog No. 4	17-12-38	Subcutaneously	5 c.es.	do	Died on 21-1-39	36
— do	Cat No. 2	31-12-38	do	3 c.es.	Heart blood	Destroyed on 2-3-39	—
E. G. Pig No. 5	G. Pig No. 6	30-12-37	do	$\frac{1}{2}$ c.es.	do	Developed paraplegia Destroyed on 20-1-38	22
F. G. Pig No. 6	G. Pig No. 7	20-1-38	do	4 c.es.	do	Developed paraplegia Destroyed on 28-3-38	68

RECORD OF MERCURIC CHLORIDE TEST

Table II

Date of Test.	Species of Animals Tested.	Undiluted. 1 drop to 1 c.c. Mercuric Chloride Solution.	Diluted in normal Saline.			Remarks.
			1-10	1-20	1-40	1-80
6-2-38	Experimental Goat	+	+	+	+	+
8-3-38	do	+	+	+	+	+
1-4-38	do	-	-	-	-	-
9-4-38	do	-	-	-	-	do
14-4-38						
22-4-38						
6-2-38	Guinea pig No. 4	-	-	-	-	-
28-3-38	Guinea pig No. 7	-	-	-	-	-
29-3-38	Guinea pig No. 8	-	-	-	-	-

1 drop serum = 0.05 c.c.
Strength of Mercuric
Chloride Solution used
was 1-25,000.

do
do
do

RECORD OF FORMAL-GUL TEST

Table III

Blood drawn on	From	Test applied on	Re- sults	Remarks
22-11-38	Experimental Calf	13-12-38	—	Strength of dilution was 1 c.c. of Serum to 1 drop (0.05 c.c. of Commercial Formalin.
do	Experimental Goat	do	+	do
13-12-38	Experimental Calf	17-12-38	+	do
do	Experimental Goat	do	—	do

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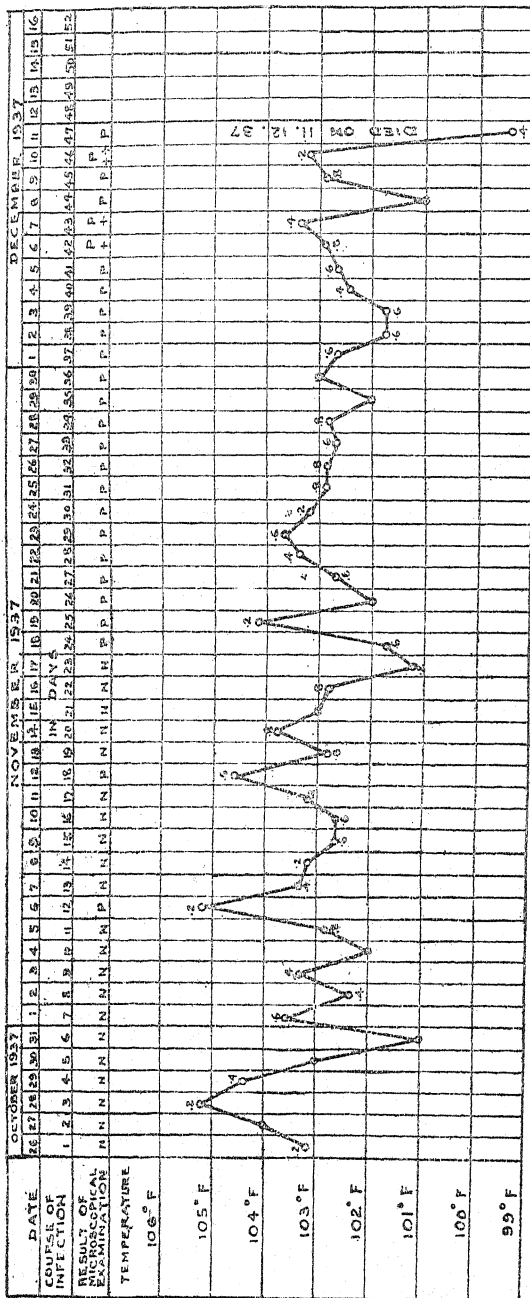
TRY PANOSOMA EVANSI EXPERIMENT
DOG N91

DATE	OCTOBER, 1938							NOVEMBER, 1938							DECEMBER, 1938																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5	6	7	8
COURSE OF INFECTION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5	6	7	
RESULT OF MICROSCOPIC EXAMINATION	M	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
105° F																																						
104° F																																						
103° F																																						
102° F																																						
101° F																																						
100° F																																						

THIS EXPERIMENTAL DOG WAS INOCULATED SUBCUTANEOUSLY WITH S.C.C. OF BLOOD FROM THE JUGULAR VEIN OF THE EXPERIMENTAL GOAT ON 24-10-38. IT DIED IN OF 5-12-38

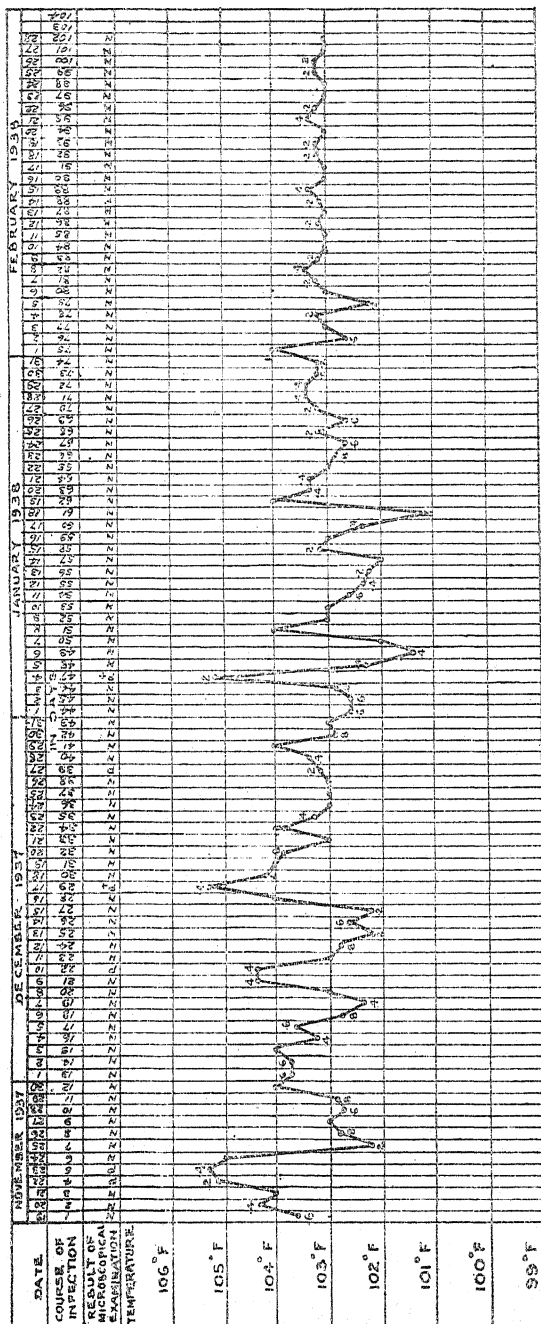
N = Negative FOR T. EVANSI
P = POSITIVE (SCANTY)
P+ = DO - (FEW)
P++ = DO - (NUMEROUS)

TRYPANOSOMA *evansi* EXPERIMENT GUINEA - FIG No 1



THIS GUINEA-FIG WAS INOCULATED WITH 4 C.C.S. OF BLOOD FROM A SIAMESE BUFFALO (No 25) IN 1 C.C. SODIUM CITRATE SOLUTION ON 26.10.37 (INTRA-PERITONEALLY).
IT WAS FOUND DEAD ON 11.12.37 AT NOON.
N = NEGATIVE FOR *T. evansi*; P = POSITIVE FOR *T. evansi* (scanty); P++ POSITIVE FOR *T. evansi* (few);
P+++ POSITIVE FOR *T. evansi* (numerous). THE MICROSCOPICAL EXAMINATION WAS DONE ON WET BLOOD FILMS UNDER THE 1/2 DRY FILMS

TRYPANOSOMA *evansi* EXPERIMENT EXPERIMENTAL GOAT



THIS EXPERIMENTAL GOAT WAS INOCULATED WITH 4 C.C. OF HEART BLOOD FROM GUINEA-PIG NO. 1 IN 1 C.C. OF (SUBCUTANEOUSLY) SODIUM CITRATE SOLUTION ON 12.11.37 WHEN *T. evansi* WAS PRESENT IN BLOOD OF THE LATTER (GUINEA-PIG NO. 1). IT WAS DISCHARGED ON 26.4.38. AS FREE FROM *T. evansi*.
 N = NEGATIVE FOR *T. evansi*; P = POSITIVE FOR *T. evansi* (SCANTY); P+ = POSITIVE FOR *T. evansi* (FEW).
 THE MICROSCOPICAL EXAMINATION WAS DONE ON WET BLOOD FILMS UNDER THE 6 DRY LENS

FLIES AND THEIR CONTROL IN CATTLE FARMS AND DAIRIES

BY

N. S. SANKARANARAYAN, G. M. V. C.,

Imperial Veterinary Research Institute, Mukteswar.

Until the year 1888, the fly was known merely as a source of annoyance to animals and men and was popularly called the 'harmless fly'. It is reported, however, that during the Spanish American War, flies, by the transmission of typhoid fever caused greater losses among the American soldiers than did the whole of the Spanish army. This discovery has, perhaps in no small measure, been responsible for the advances in preventive medicine that have been made subsequently and many out-breaks of diseases have since been traced to the agency of these insects.

There are several ways in which the fly plays a part in the dissemination of disease. In the case of Nagana for instance, the trypanosome undergoes developmental changes in the guts of the 'tsetse' fly, whence it is transmitted through the salivary secretion of these insects. In other cases, biting flies suck the blood from a diseased animal and, by the act of biting healthy animals, simply inoculate into them the infective material. In the case of non-blood sucking flies, such as the common house fly, the method of transmission is usually through direct contamination of food. Few flies are entirely free from germs for one reason because they habitually frequent manure heaps and other exposed excreta. When, thereafter, they settle upon clean food prepared for human or animal consumption, the food is naturally infected. In the same way, they alight upon and infect open wounds. Further, while pupating, the larvae of flies are known to imbibe large numbers of bacteria which eventually pass on into the intestines of the adults (Glaser, 1923). Gussow (1908) allowed a fly to pass over sterile media. Later he found 116 colonies of bacteria and 10 colonies of fungi in the culture. Among these were acid-fast bacillae, *B. coli* and pyogenous cocci. Parker (1916) estimated that a fly originating from the slums of a city, carries from 800,000 to 500,000,000 bacteria, mostly of the enteric type, though he showed that it is unlikely to pick up more than 21,000 to 100,000 germs from cleaner areas. Further more he found that 75 per cent of flies frequenting dwelling houses are infected with intestinal germs.

Distribution of flies

Flies of one sort or another are found everywhere. They occur in equatorial regions, as well as near the poles. They are, however, most numerous in tropical regions; while, the prevalence of insanitary conditions

favours their multiplication. In certain southern states of the United States of America, the fly nuisance has seriously impeded the livestock industry. In Australia, it is a source of considerable annoyance to sheep breeders. In Africa, the tsetse fly by spreading trypanosomiasis among both humans and cattle has been responsible for the depopulation of wide tracts. In India outbreaks of cholera and rinderpest are known to occur during the fly season and these insects have been incriminated in the rapid transmission of these diseases.

Flies as transmitter of Disease

The body of the fly is well adapted to the transmission of disease organisms, as it is covered with hairs resembling bottle brushes from which germs are not easily removed. While feeding on excreta or other discharges, flies readily ingest disease organisms, which they later pass out either in the course of defecation or by regurgitation. Consequently the possibility of food materials being contaminated in this manner is considerable. Typhoid fever is spread among human beings in this way by the common house fly. Tuberculosis, ophthalmia, anthrax, cholera, plague and myiasis are only a few among a host of other dangerous diseases which are similarly disseminated or are mechanically transmitted. Mitzman (1914) succeeded in transmitting anthrax to animals through the bites of *Stomoxys calcitrans* and *Tabanus striatus*. Wollman (1927), experimenting in Tunis, found that the common house fly was infective for 24 hours after coming into contact with *Brucella abortus* and *Brucella melitensis*. It is, therefore, little wonder that these diseases and others such as black-quarter, tuberculosis, John's disease and haemorrhagic septicaemia spread so rapidly. Besides these diseases, it has been proved that almost 90 per cent of cattle and sheep are affected with various forms of helminthiasis. Here again the fly is largely responsible. It has been shown that the fly is able to ingest eggs of the tape worms, *Diploidium caninum*, *Tenia Marginata* and *Tenia serrata* and later to infect food materials with them. Podyapols Kaya and Gnednia (1934) working in Moscow found helminth eggs in specks or 'vomits' deposited by flies upon the window panes of slaughter houses and restaurants. Patton (1932) and a number of other workers have shown that in several parts of the world the common house fly is the carrier of *Habronema* to equines, while *Musca crassirostris* is the probable transmitter in India.

Description of a Fly

All flies belong to the order Diptera or two winged insects. The body of a fly consists of the head, the thorax and the abdomen. The larger part of the head, is occupied by a pair of compound eyes. Between these two compound eyes, there sometimes occurs a group of single eyes. In the female of certain species such as the house fly, the space between the eyes is wider than that in the males. In the case of some Diptera, such as the

house fly, the mouth parts are provided with a pair of oral lobes and are adapted for sucking; whereas in others, such as the stable fly, the proboscis is pointed and adapted for piercing.

- (a) *Anatomy.* The mouth leads to the pharynx. From the pharynx the gullet runs through a set of nerve ganglion into the thoracic cavity entering the proventriculus. The nerve ganglion mentioned above represents the brains of the fly. The proventriculus, after giving out a branch to the crop, opens into the stomach and continues, as the intestines, inside the abdomen. At the posterior end of the body, the intestines open into the rectum which terminates in the anus. The crop acts as a reservoir, similar to the rumen of cattle, and, like cattle, flies require a large quantity of fluid for regurgitation. Liquid food from the crop passes to the proventriculus and thence to the stomach for digestion.

The respiratory system is represented by breathing pores, situated on the sides of the body, which supply air to the air-sacs in the head and thorax and at the anterior end of the abdomen. The air-sacs give off trachea to the muscles and viscera. The vascular system of the higher animals is absent in the fly but there is a muscular tube at the dorsal part of the abdomen representing the heart. The whole body cavity is filled with a colourless fluid containing fat corpuscles. This corresponds to the blood of higher animals. During the fly season, the abdomen of the female fly is nearly filled with white cylindrical eggs. These are packed in the two ovaries, each of which may contain some 60-70 eggs. The ovaries open into the ovipositor, which can be made to shoot out by gently pressing the abdomen of the fly. Eggs are deposited through this tube-like ovipositor. The male reproductive organs consist of a pair of testes and a chitinous penis.

Different kinds of flies

There are about sixty families of Diptera, of which the family Muscidae, a large assemblage of flies, is divided into numerous minor groups which have been accredited by several authorities with family rank. Few of the species included in these families are blood suckers.

- (a) *The Common House Fly — Musca domestica.* Of the several species in the family, the common house fly *Musca domestica* is a cosmopolitan species as is illustrated by the fact that, in a collection of flies made from different parts of America, 90-98 percent proved to be *Musca domestica*, (Hewitt — 1914). The true *Musca domestica*, however, is found only in temperate regions and Patton (1933), after years of study, says that he has no proof that it has established itself on the plains of India. However, this review is intended only for the benefit

of husbandmen and is not intended to deal with problems which are primarily of entomological interest.

The house fly is not capable of biting as its mouth parts of proboscis is blunt and broad but it is a source of persistent annoyance to cattle, by reason of the determined manner in which it settles upon them. *Musca domestica* can be distinguished from other flies of similar appearance by the following peculiarities:—The dorsal region of the thorax is dusty-gray in colour with four equally broad longitudinal stripes, the light region of the abdomen is yellowish and transparent. The dorsal line is blackish brown. The eggs are blackish brown and the wings, though mainly tinged with pale gray, have a yellowish base. The broad frontal stripe of the female is not wider at the anterior end than at the bases of the Antennae. This stripe though usually velvety black, may often be reddish and shimmering. The abdomen gradually becomes darker as it nears the posterior part of the body.

- (b) *The Stable fly — Stomoxys calcitrans*. This fly, though smaller than the house fly, is sometimes called the biting house fly owing to its close resemblance to the latter. The main difference is in the proboscis which, in the case of the stable fly, is pointed and thus adapted for piercing and sucking blood. Being provided with a blood sucking apparatus, its feeding differs from that of the house fly in that it does not feed upon filth. For the same reason, it does not frequent human habitations. Both sexes attack cattle, upon which they inflict painful bites. They usually choose that part of the animal's body, which is beyond the reach of the animal, such as the back, hump, neck, belly and legs. As a blood sucker, the stable fly is capable of spreading bacterial diseases such as Anthrax. Apart from carrying diseases among cattle, they cause considerable annoyance to them when the cattle are grazing, feeding or being milked. Many a cow gets into the habit of kicking when being milked, because of the constant irritation caused by these flies. The milk yield may also be affected and the once glossy coats of the flies' victims, become rough and patchy, while the 'bald' parts render them progressively exposed to bites. Riley and Johannsen (1932) describe the fly as follows:—The frontal stripe is black, the cheeks white, the antennae black slender and adapted for piercing. They project forward in front of the head. The thorax is grayish, marked by black stripes. The abdomen is gray dorsally and legs are black.

There is another fly known as the horn fly, *Lyperosia exigua* rather like the stable fly. It is, however, smaller in size and usually goes about in small swarms. These swarms are generally found on the backs and humps of animals. In the genus *Musca*, Patton (1932) has recorded a number of the species *Haematophagus*, which feed on blood, although

they are devoid of piercing mouth parts. They suck this blood from wounds made by true biting flies whom they usually follow.

- (c) *Tabanidae* or *Gad flies*. The *Tabanidae* are large, sturdy flies with broad abdomens and large hemispherical heads with large eyes. The eyes are sometimes hairy, sometimes banded and frequently have a metallic gleam. The antennae are short. The proboscis is short with broad cutting blades. The females are blood suckers, while the males are flower feeders. This species is very widely distributed in India. *Gad* flies inflict extremely irritating bite upon cattle and horses and are capable of accompanying a trotting horse for a considerable distance. Several species of *Tabanidae* have been shown experimentally to be capable of transmitting surra (*Trypanosoma evansi* infection).
- (d) *Sarcophagidae* or *Flesh flies*. There are many species and they are mostly carrion feeders. Their maggots not infrequently occur in wounds. Many species are viviporous producing maggots at birth. The larvae of this fly are sometimes found in the nasal passages and intestines of men and animals producing internal myiasis.
- (e) *Calliphoridae* or *Blow flies*. Broadly speaking, there are two varieties of these flies commonly found in India, namely blue and green flies. They are chiefly responsible for the production of maggots in wounds and are known as 'Myiasis-producing' flies. They are frequently seen in garbage, cattle yard refuse, carcasses and, as already mentioned, in wounds and ulcers. They are easily distinguished by distinctive colours of the thorax and abdomen.
- (f) *Hippoboscidae*. These flies are flat with small heads and legs. Their broad thorax gives them the appearance of bloated ticks. They use their wings infrequently but are capable of running swiftly over an animal's body. They have the peculiar habit of progressing sideways instead of straight. They persistently suck blood from their hosts and the sites they commonly prefer are the thighs, neck and hump, or wherever there is a hairy growth in which they can hide. Their skin is so leathery that it is difficult to kill them in the ordinary way and it is usually necessary to wring their necks. Fletcher and Sen (1929-30) have recorded four genera of these flies in India.

Life History of Flies.

Most flies have four stages in their life cycle, egg, larva, pupa and adult. They lay eggs in a medium suitable for the development of the larva. Some species, however, retain their eggs in the abdomen till they have hatched into maggots. (e. g. flesh flies and tsetse flies). The eggs are laid singly or in clusters and are frequently white and cylindrical, more or less tapering at the extremities. Under favourable conditions of temperature

(about 35°C), the larva of the house fly may hatch out within a day. The larva is thin and tapering towards the head and moults, as it develops. When full grown, it is yellowish-white and may frequent moist faeces or decaying matter. It now burrows under loose earth and assumes the resting or pupal stage with a cylindrical body and round ends. During summer weather, the adult fly emerges from the pupa within 2 or 3 days. It takes a few hours for its wings to straighten out and strengthen sufficiently for flight.

Flies grow to maturity in about a fortnight. Four days after mating they are able to deposit eggs. A single fly is capable of laying about 1,000 eggs in its life time at the rate of about 150 eggs at a time. Parker (Loc. cit) in estimating their potential reproductive capacity states that a single fly under favourable conditions is capable of producing 5,589,720,000 descendants from April to September. Exact information is not available concerning the longevity of an average fly in natural surroundings but according to Graham Smith (1914), a fly cannot live for more than three weeks in summer in captivity. At the end of the summer a large proportion of flies are attacked by a fly fungus known as *Empusa muscae*. Those that remain, hibernate during the winter and reappear in the spring. By summer the fly population is again at its maximum.

Breeding.

Most of the flies found in cattle farms breed in decaying organic matter, especially cattle yard manure, human excreta or garbage. Hewitt (Loc. cit) found larva feeding upon human excrement, straw, textile fabrics, mushrooms, decaying vegetables, grains and in spittoons. The adults besides depositing eggs upon the materials mentioned above, frequently feed upon them. Cattle yard manure is the breeding ground of most species of flies of the Muscidae family and this is why flies are particularly a nuisance in farms. It is worthy of note, however that *Musca domestica* prefers pig and horse manure and to a lesser extent calf manure for breeding and that it does not breed at all in fresh cow manure. Thomsen (1934) covered a heap of pig manure with fresh cow dung and found that no larva developed. Even the stable fly breeds in cow-dung only when it is mixed with straw and urine.

Open straw stacks are another breeding ground for flies. When the stacks are exposed to rain, *Stomoxys calcitrans* find the damp straw suitable for breeding. It also breeds in the following materials:—open silage pits, chaffed straw bits removed from troughs and thrown in heaps, heaps of straw left after thrashing and moist rice straw stacks. It has been found that the stable fly is not attracted to garbage.

Tabanidae usually deposit their eggs on vegetation over-hanging water, the larvae being aquatic by nature. The eggs may sometimes be found sticking to the stems and blades of rice, in rice fields containing water.

'Blow flies' the so-called green and blue bottle flies, breed in decaying organic matter and also in the wounds and ulcers of living animals. Gray flesh flies being larviparous, do not require a medium for depositing their eggs.

Control and Prevention

The question of the so-called fly nuisance has engaged the attention of numerous workers. While it is hardly possible to keep farms completely free from flies, they may be kept under control and their number may be very appreciably reduced, if proper measures are taken in time. It is true that organised community efforts are always necessary to successfully combat this nuisance but much may be done in this respect by individual farms, particularly by those situated at a distance from cities. Howard (1917) even considers that a flyless farm is possible and has prepared a model exhibit of such a farm, showing how the various farm buildings may be made fly proof. It is noteworthy that in certain military Dairy Farms in India, the fly nuisance is to a great extent kept under control.

The practices of many Indian farmers and gowallas, however, favour fly breeding. The custom of allowing manure to accumulate inside and outside cattle sheds leads to the multiplication of flies on the premises. In rural areas, the floors of cattle sheds owned by gowallas are often full of cracks filled with decaying manure and these afford excellent breeding places for flies. It is usual to find numerous maggots in such cracks all the year round. The only method of cleaning of cattle sheds practised by these gowallas is to sweep the floor with a rough broom stump and throw the sweepings outside the sheds. This merely transfers the breeding ground and in no way lessens the nuisance. Again it is the practice of farmers to thrash grain in the field and scatter the straw in loose piles, which, when soaked with rain, make a suitable medium for the breeding of stable flies. In the rotten straw, not only stable flies but also house flies breed abundantly. Cow-dung cakes, which are made in every village in India provide another suitable medium for fly breeding and under every cake may be seen myriads of wriggling maggots. By the time the cakes dry up, the maggots have developed into pupae.

Although a favourable breeding ground for flies, farm yard manure is essential for successful farming and cannot, therefore, be destroyed. It is, consequently, desirable that the manure should be stored in a manner that will prevent the development of fly larvae. All open manure pits should be covered. They should be constructed on hard ground with concrete sides to prevent larva from reaching the soil to pupae. The sides of the pile should be clean cut and vertical or slightly sloping towards the centre. As fresh manure is added, it should be tightly packed. This helps fermentation and the heat produced by this fermentation destroys the fly eggs, larvae and

pupae. Lefroy (1916) recommends spraying the surface of the pile with a solution of 1 pound borax in 6 gallons of water, this being sufficient to treat 30 square feet of surface area; or the scattering of powdered borax over the manure. One pound of borax mixed well with 16 cubic feet of manure and the mixture scattered over the pile and sprinkled with water destroys all larva. The United States Department of Agriculture experimented upon the manure so treated and found that the manurial value is retained, if 15 tons of the manure is used per acre of field. (U. S. Farmer's Bull. 1408.)

Rouband (1918) found that horse manure kept for as short a time as 24 hours in a stable, produced in warm months an average of 10 to 20 thousands larvae per cubic metre. (It is estimated that a horse in warm months is capable of aiding the development of 200,000 flies per month). Where fermentation has been allowed to proceed for 24 hours, it protects the manure from further production of larvae. A heap of six days old manure no longer contains fly larvae, the latter having migrated for pupation. Anti fly measures must, therefore, be taken within 5 days of the removal of the manure from the stable. A complete stirring up of the manure on the day after deposition, repeated on the two following days, destroys 90 per cent. of the larvae since they are then exposed to a temperature of over 50°C. It is a good plan to bury the new manure at least one foot deep inside the old heap, instead of dumping it on the surface.

In New Zealand special instructions are issued to farmers for the treatment of manure. An area of hard level ground at least 3 x 4 feet, greater in extent each way than the ultimate size of the intended dump, is prepared. This is cemented or, if not, top dressing of one part by volume of mineral oil or wood preserving oil mixed with 40 parts of fine soil applied to the bottom of the pit and beaten down, at the rate of one gallon of oil for 100 square feet. Upon this each day's manure is dumped to form a rectangular block. Each load of manure added, must be pressed down with a shovel and, if the weather be dry, the surface of the pits should be sprinkled with water. It was found that at 4 inches beneath the surface of the pits thus treated, the temperature was 169°F. No maggot can remain alive at this temperature. The fertility value of the closely packed manure is also found to be greater. If maggots are discovered at the sides of the block it is advisable to close the sides with gunny bags soaked in kerosene oil. The sacking should only be allowed to remain for a week, for by that time, all the maggots will have been destroyed. In addition the day's dump may be turned over on the two following days, so as to bury the maggots deep and expose them to the heat and gases inside.

In the experiments conducted by Howard (Loc. cit), it was found that if a shovelful of chloride of lime be scattered daily over the fresh manure in the pit at one pound to 8 quarts of manure, the breeding of flies can be

effectively controlled. Forbes (quoted by Howard 1911), experimenting in Illinois, found that a solution of one pound of iron sulphate in a gallon of water, sprayed over the manure pit, prevented fly breeding. Iron sulphate kills fly larvae and deodorizes the manure, but does not interfere with its value. Poisoning the manure with sodium arsenite before removal from the yard to the pit is recommended by the Department of Health in England. One pound of sodium arsenite is mixed with 12 pounds of treacle and dissolved in two pints of water and sprayed over the floors of cattle sheds before cleaning. A watering can can be conveniently used instead of a sprayer. This mixture is useful for spraying open drains, dust bins and garbage trenches, as well as open manure pits. The value of the manure is not in any way altered by the use of this spray. The only precaution necessary is to see that cattle, young stock, dogs and other animals are not allowed to stray in the vicinity lest they pick up the poison accidentally.

Sergeant's (1934) method of providing fly free manure heaps is worth adopting on farms. This consists in the construction of a concrete floor 3 yards square fenced with 5 ft high wire surrounded by a masonry gutter. The manure is heaped upon the square flooring and tightly packed. The maggots from the upper layer when they migrate fall into the gutter.

It is a good principle to have, some distance away from the cattle yard, a well built and well kept manure pit, where the daily accumulation of manure can be dumped. In the absence of a concrete manure pit, it is better to spread every day's manure in the field exposed to the sun, the drying effect of which will prevent the breeding of flies.

It should be remembered that sources of fly breeding are many, some of which one is inclined to overlook. In order to attract flies, it is a good plan to put up maggot traps here and there in the cattle yard. The United States Department of Agriculture has recommended (Bull. 1408) a trap consisting of a shallow concrete basin sloping slightly and connected with a cistern by means of a drain, which is fitted with a stopper. Over this basin is erected a wooden platform of strips of wood, nailed on a frame, one foot high, the strips being $1\frac{1}{2}$ inches apart. On this platform the manure is placed and water is kept in the basin. Flies are attracted to the manure to deposit their eggs. The maggots that are produced, migrating in search of soil for pupation, fall into the water and are drowned. Ramakrishna Iyer (1935) describes four types of maggot traps based on the knowledge that mature larva migrates from moist manure to seek dry soil for pupation. One such trap consists of wire netting containers filled with manure and hung over water troughs from trees or the like or surrounded water. Such traps are in use at the Government Cattle Farm, Hosur. They prove handy and cheap. In order that such traps should be effective it is, of course, necessary to prevent manure collecting in other places.

Biting flies can be kept down by the proper disposal of stable refuse and cattle yard manure and the proper stacking of straw. In the absence of a shed or barn, the straw should be stacked with vertical sides and top rounded to prevent rain water wetting the stack. After stacking, the base should be cleaned and small bits, which cannot be utilized as fodder, should be burnt in the field. In places where there is a heavy rainfall, as in Bengal and on the west coast of India, it is advisable to protect the stack from rain, particularly when the stack is of rice straw. When a stack is found to have produced numerous flies, it is an indication that the straw is moist and rotten and, therefore, unfit for fodder.

Human excreta is another dangerous medium for fly breeding. In private farms and villages in India, little or no care is taken about the hygienic disposal of night soil. In villages almost any place that provides some degree of privacy is used as a latrine. In cattle farms, gowallas and other farm servants should be taught the seriousness of leaving night soil exposed in this manner. It is also desirable that the authorities in charge of all Government Farms should give due consideration to the necessity for providing sufficient, properly constructed latrines for their menial staff and arranging for the daily incineration of night soil. Jolly (1923) has designed an automatic fly proof latrine seat which is claimed to be specially adapted to Indian conditions, as it meets all objections that might arise from prejudices. Covering the excrement with earth is found to be unsatisfactory as flies have been known to force their way to the surface from pupa, buried 6 feet deep in sandy soil. In open privies, spraying with kerosene oil will do much to check the breeding of flies.

Other Breeding Places

In combating the fly pest, due attention should be paid to such sources of fly breeding as dust bins, kitchen refuse, vegetable refuse and marshy places containing decaying vegetable matter. Even paper and rags under suitable conditions of moisture and heat may afford such breeding places. The keeping of refuse in fly proof receptacles and its incineration later are the only satisfactory means of coping with this danger. The proper disposal of cases is another important consideration in the campaign against flies, for, as has been pointed out earlier, blow flies and even house flies breed in putrid flesh. It is estimated that a million flies may be produced from a single carcase (W.S.A. Bull 85.) Foreman and Graham Smith (1917) recommend the application of creosote oil to dead bodies, particularly to the skin and openings before burial. This will prevent putrefaction and a subsequent fly pest. Incineration is by far the most efficient method of disposing of carcases. Hurley and Krishnamurthy's (1932) field incinerator is cheap and economical in use and is suitable for small farms. Burial is cheaper than

incineration and equally safe but, when this method is resorted to, it is essential that the carcase is buried deep with layers of lime both below and above. The United States Department of Agriculture in Bulletin 857 recommends the cutting up of carcasses and the exposing of the pieces to the hot sun as one of the methods of disposing carcasses. This operation would, however, be unpleasant to perform and its safety is open to doubt.

The Prevention and Destruction of Flies.

- (a) *Poisons.* The actual destruction of flies on a farm is difficult and of little value unless it is accompanied by measures directed against their breeding. For the destruction of flies various devices are available such as poisoning, trapping and swatting. Unfortunately a large majority of the poisons which can be used against flies are also toxic for cattle and men. 40 per cent. formalin is a notable exception to this, for, while it is harmless to men and animals, it is an effective insecticide when baited with sugar, jaggery or milk and placed in cups or saucers. Stevenson and Phelps (1916) found the following mixture effective :— two tea spoonfuls of 40 per cent. formalin mixed with $\frac{1}{2}$ a pint of clear lime water and one or two-spoonfuls of sugar ; the solution made up to one pint by the addition of water and the mixture is placed in a vessel, covered by a perforated tin lid through which absorbant wicks are passed. In the absence of any other food materials nearby, the flies are attracted towards this mixture. A sip at this, it is said, usually kills them in a few minutes. In dry weather, this mixture can also be employed near manure pits.

Howard (1911) successfully used a mixture against flies, consisting of one tea spoonful of cream, one tea spoonful of brown sugar and half tea spoonful of powdered pepper.

Fumes of burning pyrethrum, camphor and benzoin are said to have a stupefying effect on flies and are recommended by many people. The New Zealand Department of Agriculture (1938) gives the following instructions 'Dissolve 1 gm. of sodium arsenate and two spoonfuls of sugar in $3\frac{1}{2}$ ounces of water.' Cotton pads soaked in this solution and kept on trays are said to attract flies and destroy them'. Kerosene oil, phenyle, petrol, turpentine, neem oil etc. are also used as repellents against flies but their effects are not lasting.

- (b) *Traps.* Tangle-foot papers may be used effectively for trapping and destroying flies. These are obtainable from dealers or can be made as follows :— Ordinary paper is glazed by applying a thin layer of a solution of 1 ounce of glue in 3 ounces of water. This is then dried. Five parts of castor oil and 8 parts of resin are heated together till the resin dissolves. This is applied hot over the glazed paper. Fly papers of a superior quality may be made by the method recommended by Jack (1916) :— 12 parts by ounce weight of resin and 5 parts by fluid ounce

measure of ground nut oil and one part of fluid ounce measure of crude vaseline are well mixed and heated together without boiling, till the resin is dissolved. This is then spread over paper for use. It is claimed that this mixture when kept in closed vessels or tins remains effective for a long time.

Various methods have been suggested for trapping flies when they are about to enter a building. Thus, Hitchins (1933) describes a cheap and effective window screen fly trap which can be used in stables and dairy buildings. A trap designed by Hodge (W. S. A. Farmers Bull. 1897) is said to be very effective if fitted closely into one window, while all other entrances are kept shut.

An interesting method of trapping flies on farms by the use of a Decoy and Bourgaults Fly trap is described by Loughman (1930). A black tailless bullock is used as a decoy and is slowly driven through the cattle yard. Flies settle on the bullock which being tailless is unable to drive them away and the animal is then driven through a Bourgaults trap. The trap consists of a darkened building of rectangular shape with two longitudinal partitions leaving gaps at opposite ends inside. Entrance and exit are provided at diagonally opposite ends, so that from the entrance to the exit animals have to pass through an S shaped passage, in the middle of the S shaped passage are two brushing devices which are made of a rectangular frame to which are tied, bunches of palm leaves. The free ends of the broom shaped leaf bunches meet in the middle line of the frame allowing passage to cattle through the frame work while the leaf bunches brush off the flies on them. Animals are driven through this darkened buildings to free them from flies. The flies which are brushed off make for the nearest source of light at the hole at one end of the building. From there they are led to a trap where they are destroyed. The building and the trap can profitably be made use of for ridding the cattle of flies by driving the whole herd through the trap. It is said that cattle like this operation so much that they run to the building of their own accord as soon as they are let off. This method has been tried in Mauritius and is said to be efficient.

(c) *Repellents*. Lefroy (1916) controlled fly pests in Military Camps in Mesopotamia by using a mixture of half a pound of sodium arsenate and two and a half pounds of jaggery in two and a half gallons of water. Strips of cloth kept on a tin like a roller towel dipped in this mixture and hung up with one end kept soaking in the mixture attracted flies even from a distance of 200 yards. James (1935) modified this trap and made it simpler by using an empty ghee tin and the following mixture :—

Sugar, molasses or jaggery.	...	1 lb.
Sodium arsenate	...	1 lb.
Water	...	10 gallons.

This he found effective in Military Hospitals.

Foreman and Graham Smith (1917) used creosote oil for spraying inside mess halls and hung a piece of cloth soaked in this oil over the entrance. This they found was an efficient repellent and kept the hall practically free from flies.

(d) *Insecticide Sprays and Powders.* Concurrently with the adoption of measures designed to control the pest outside the cattle sheds, due attention should also be paid to conditions inside these premises. The floors of these sheds should be made of non-absorbent materials, care should be taken to see that they are free from cracks. It is economical in the long run to have a fly-proof milking shed, for such a shed to be effective, it is necessary to ensure that the animals are free from flies before entering. This can be effected by spraying the animals with insecticides which will also protect them outside. For spraying and dusting various solutions and powders have been found efficient. Of these the cheapest and most easily obtainable is kerosene oil emulsion. This is prepared by dissolving 1 pound of any ordinary cheap soap in 1 gallon of water and boiling the solution. The kerosene oil is then added slowly while the mixture is stirred vigorously with a bundle of twigs or an old cocoanut broom. One part of the emulsion dissolved in 10 parts of water is used for spraying the animals. In the Military Dairy Farm Kirkee, this is a daily operation. It takes only about 15-20 minutes to treat a herd of 300 milch cattle and the time so spent is well repaid in the relief afforded to the animals. However, Melvin (1932) studying the physiological effects of oil sprays on animals, found that all petroleum oil sprays cause a measurable rise of temperature and increase the respiratory rate of both heifers and cows, particularly when the atmospheric temperature is high. Freeborn and his collaborators (1934) explain this as resulting from the interference of the oil with the cooling function of the skin. Such interference, they suggest, can be overcome by the addition of Pyrethrum extract to the solution in the following quantities :—

Petroleum	...	84 c.c.
Pyrethrum extract	...	48 c.c.
Steam distilled pine oil	...	48 c.c.
Triethanolamine Oleate	...	16 gms.
Water	...	100 c.c.

The solution to be diluted with $4\frac{1}{2}$ parts of water.

Baber (1933) substituted citronella oil to Pyrethrum extract in kerosene instead of the pine oil and Triethanolamine oleate in the mixture and found it equally efficient. His formula is :—

Pyrethrum extract	1 part.
Kerosene oil	64 parts,

Citronella oil	5 per cent.
Petrol	15 „ „

Twin and Herman (1927) used a simple solution of Pyrethrum in kerosene oil, shaken well and kept for 24 hours and filtered. This spray is cheap and has not been observed to have any deleterious effects.

Cory (1917) tried coal tar products for spraying but found that they are inclined to flavour the butter from animals sprayed with the solution. He used 2.3 lbs of caustic soda (98%) dissolved in a quantity of water sufficient to dissolve a gallon of pine tar creosote. When the cows were sprayed with this solution before morning milking, they were found to remain free from flies, particularly from *Stomoxys calcitrans* and other biting flies throughout the day.

Cross (1916) used a series of fly sprays for camels in Lahore; and found, one gallon of kerosene oil with powdered naphthalene 4 ounces, soap 1 pound and water 4 gallons very effective against *Stomoxys calcitrans*. He claims that cows are protected from biting flies for a week after a single spraying with this solution.

Cory and his co-workers (1916) experimented with 16 powders and one spray against cattle flies and found a mixture of pyrethrum and Derris most efficient, applied with a pump gun.

Dairy Buildings

For the clean collection and distribution of milk, it is essential that the Dairy buildings, milk record rooms, etc. should be made fly-proof. In very progressive countries attention is even paid to the kind of paint used inside Dairy buildings. Freeborn and Berry (1923) found that white or other pale colours are more repellant to flies than dark ones. A similar observation has been made by Haseman (1927). Indeed, as a proof of this, it has been observed that black cows attract more flies than white ones.

All buildings should be protected by wire netting. Blacklock (1935) recommends nettings of 14 meshes to a linear inch of wire No. 30 Imperial standard gauge for rooms and 18 of No. 28 for other purposes, since the latter will keep out even mosquitoes. For nettings, Barronia metal shown in Sierraleone to stand up well to all conditions of weather, is cheaper than Monel metal and is equally efficient. Fly proof netting can be further improved by Collins' (1931) method of electrification. This consists in the installation in dairy buildings of electric screens of woven copper wire along an insulated frame work. The screens are supplied by 3,500 volts of high tension electricity, 60 cycle lighting current, drawing a charge harmless to

man and cattle but fatal to insects. As many as 20,000 flies are reported to have been killed daily in one Dairy by this means during the fly season.

Feeds and Feedings.

It has been observed that places, where silage is fed to cattle, become fly infested till the silo is emptied. As a silage is a summer fodder in India the feeding period coincides with the fly season. Little can be done to prevent this particular nuisance but scrupulous care should be taken to prevent the silage from being spilt in transit from the pit to the feeding trough. Concentrate foods, particularly oil cakes, when fed soaked, attract swarms of flies. In Military Dairy Farms, dry concentrates are fed and this has gone a long way to control the fly pest. During recent years, molasses has been recommended as a cattle feed. It has, however, been found by nutrition experiments conducted at Bangalore, that molasses while contributing little to the food value of the concentrates attracts swarms of flies to the yard.

Natural enemies.

Destroying insect pests by the introduction of their natural enemies into the field is a well known entomological method of waging war against them and may well be adopted as a supplement to other methods of control. Birds and poultry are capable of destroying the larvae and pupae of flies and also ticks. They dig up old manure piles, droppings or moist straw heaps and devour the maggots breeding in them. It is, therefore, a good plan to keep poultry on cattle farms. Schuurmans Stekhoven (1925) examined the stomach of birds of the species *Bubuculus Coromandus* which sometimes occur in flocks in rice field and found in one bird 40 tabanids, 5 *Musca* and 1 locust and in another 17 tabanids, 8 *Musca* and 4 locusts. These findings suggest that these birds might profitably be introduced into areas where they are unknown to assist in combating insect pests. The method of controlling house flies through the agency of birds has been adopted by Simmonds (1925 and 29) in Fiji as a supplement to other control measures against these pests. Dung beetles of the species *Copris incertus* Var *Prociduus* and *Spalangia Cameroni* have been imported to Fiji in the hope that, by breaking up cow droppings, they will reduce the amount of material suitable for the breeding of maggots. For the same purpose ants of the species *Phiedole megacephala* have been made use of by Simmonds.

Coleman (1935) reports that the flowering shrub *Nereum oleander* traps thousands of blow flies during pollination. The growing of this shrub in cattle farms near manure pits may, therefore, prove useful as a control measure. It should, however, be mentioned that some of the species of *Nereum* are poisonous to cattle.

Myiasis

Myiasis is a condition caused by the larvae of flies attacking tissues and organs of living animals. The common species causing myiasis are the house flies and blow flies, the latter being generally responsible. Rao and Pillay (1936), working in Madras, have recorded some varieties of blow flies responsible for producing myiasis in the wounds of domestic animals. They found the occurrence of this condition high on the west coast, since this area is subject to heavy rainfall. Myiasis may be internal or external. Internal myiasis is caused by maggots invading the intestines, the anal and urinogenital tracts and the nasal passages. In animals, myiasis frequently occurs in open wounds particularly in the fly season and it is very difficult to prevent this condition unless proper treatment is given. Blow flies, which cause myiasis, may be controlled to a great extent by ensuring the proper disposal of garbage and carcasses, which are the two important media in which they breed. Repellants may be effectively used to prevent flies from ovipositing or larvipositing on preexisting wounds. The United States Department of Agriculture in Bulletin. 857 instructs farmers to apply tannic acid to fresh wounds, followed by coal tar. Tannic acid stops the bleeding and causes the tar to adhere to the affected parts. Howarth (1936) tried bone oil successfully on fresh wounds. Bone oil acts as a good repellent and at the same time hastens the healing of the wounds by promoting granulation. It is said to be useful as a dressing after minor surgical operations. Dressing oil consisting of any oil, which is used in veterinary hospitals, such as salad oil, turpentine, neem oil, tincture of iodine, camphor etc., promotes the healing of wounds as well as acting as a good repellent. Robinson (1935) recommends the application of Allantoin for the treatment of wounds. Allantoin is a substance prepared from maggots. It is harmless, soothing, tasteless, odourless and stimulates healing.

Before the year of the Spanish American war no attempt was made to study the common house fly and the serious role, which the house fly plays in our every day life, was not understood. It is astonishing therefore, to find in Kautilya's Arthashastra, dating back to 700 B.C. the fly being mentioned as one of the house pests along with rats, bugs, mosquitoes. He has even given the following prescription of a smoking powder against flies, rats, mosquitoes and poisonous germs.

“ Ballatharka phalam Mustha
Kapikachupalam thada
Ralah siddartha aethaesham
Churna dooma prabhavathah
Mooshika, Masaka, Makkah
Makoona, Vishakeetakah

Palayanthae griham mukthwa
Yadha yuddhethi katharah "

[Ballatha (seeds of *Semecarpus anacardium*), arkaphal (fruits of *Calotropis gigantea*), mustha (tuber of *Cyperus rotundus*), ralah (Bees wax), Siddartha (white mustard).].

The above six drugs are to be powdered and burnt in a place infested by rats, mosquitoes, flies, bugs and poisonous germs. The smoke will free the place from these pests ' like the battle field from a defeated army.'

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Editorial

THE REASON WHY

In the course of a strikingly refreshing and illuminating convocation address delivered to the graduates of the Madras University in August this year, Father L. D. Murphy put forth a strong and vigorous plea for more technical education in the following words. "Above all, we need more Agricultural and Veterinary Colleges. Tremendous strides have been made within the last few decades in the improvement of all manner of cattle stock, in the diagnosing and curing of plant and cattle diseases; but as yet it is on all too small a scale. The riches of India lie here and over hundred millions of its people are engaged in agriculture, but things are only being slowly worked up because the people will give themselves up to a cultural literary education instead of an agricultural and veterinary one." This is exactly what we have all along been saying in regard to Veterinary education in this country. It is also in agreement with the pronouncements of personages in exalted positions, like H. E. Lord Linlithgow and Mahatma Gandhi, who have repeatedly urged that the prosperity of the ryot and the country depends a good deal on improved Agriculture and Animal Husbandry. These two things depend, of course, upon a sound Agricultural and Veterinary education. If, in spite of all these weighty pronouncements, the youths of the country are not attracted to a course of Veterinary education what is the reason for it?

Is it because they are not alive to the needs of the country? Or is it because that they are not convinced of the truths of these pronouncements; or else, is there any other reason why there should be dearth of candidates for the study of Veterinary science? The simple and plain reason is that, in the conditions existing in this country, this technical education is practically of no use for a career in life unless it be for service under Government. And it is no use being blind to that fact. We will just illustrate this by what is taking place in the Province of Madras.

This province has got a well equipped Government Veterinary College, with a five years' course of study leading to the degree of B.V.Sc. of the Madras University which is probably the highest available qualification in Veterinary Science in India. The preliminary educational qualification necessary for admission into that College is the same as for Medicine or Engineering and the course itself is by no means easy. Now, what are the prospects of a successful candidate who has undergone this hard course of technical study? He cannot possibly expect to earn a living by setting up an Independent Private Practice, because such a thing is simply impossible in this country. The poverty of the ryots and the low value of his livestock simply preclude the possibility of his engaging the services of a Veterinary Doctor and paying him for it. Therefore the only course open to a Veterinary Graduate in this country is to enter the service of the Government or Local Board. And what does the Government pay for his services? A sum of Rs. 55/- per mensem rising by bi-annual increments of Rs. 5/- to Rs. 100, a sum which is even less than what an artisan or a skilled labourer can easily get in these days. Is this not a shameful state of affairs and wholly discouraging to the members of a scientific profession with high University and Technical education? Is it any wonder then, that the youths of the country do not care to go in numbers for that kind of education which does not promise them even a living wage? As a result of these depressingly low prospects, what do we find? The Madras Veterinary College could not get even the usual number of candidates for

admission this year, in spite of the fact that practically every one that applied for a seat was given one. We understand that even some of the candidates who first got admission later on failed to turn up. The gloomy outlook of the profession simply scared them away.

We have always contended that the Veterinary Graduate with his education and training in no way inferior to those of other services is entitled to an equal if not better rates of emoluments than similar services under the Government. We have also given in detail in a previous issue of this *Journal* the disparity in the rates of pay between the Veterinary Department and other Departments under the Government of Madras. But, unfortunately, the Government have been turning a deaf ear to all the pleadings and representations. It cannot be that the Administrative Head of the Department has not been keen in representing the case in proper perspective to the Government. Whatever the cause, we find that the Veterinary Service is the cindrella of the services and, as long as it continues to be so, there is no use blaming the people for not taking up Veterinary education.

We plead with all earnestness at our command that the authorities concerned be pleased to take up the question of improving the pay and prospects of the Veterinary Assistant Surgeons without any further delay.

THE PENSIONERS AND THE PROFESSION

The modern veterinary science and the veterinary departments in this country being yet young, there were very few or practically no superannuation retirements of the Indian veterinary surgeons until a few years ago. There have been, however in recent years, a few such retirements annually from the various branches of the veterinary departments in British and Indian India. These retired men being practically the earliest of the veterinary surgeons in the country, have rendered yeoman's service to the profession and the nation. The

presence of these pensioners is sure to enrich the public life of the locality—urban or rural—wherever they may settle down to live. The old veteran leaders in the country, when they urged for the early Indianisation of services—general, scientific and technical—advanced as one of the reasons for such a course, that the retired Government servants are great assets to the nation even in their retirement. They urged that the vast experience of these officers gained in the course of long service and practice of professions will be still available to the nation, which will not be the case when foreigners employed for periods of service, leave the country at the end of it. We shall be, no doubt, justified if we go a step further and point out that the profession and the nation expect and demand of these pensioners much greater service when they are free from the shackles of Government service. Their intimate knowledge of the country and her needs, their vast administrative and professional experience, and above all, the well disciplined life they have become used to have all well fitted them to render such service as free citizens of the State. The service rendered by them while in Government employment has been in return for the payment of salaries—no doubt in most cases illiberal and inadequate. But the service now expected of them is mostly honorary and in due discharge of duty to the land of their birth.

Expansion of the activities of the veterinary profession in its various aspects is a crying need of the country. The pensioners in the profession can take part in them and create and lead public opinion to good account. They can take initiative in many of the nation-building activities; in fact, they can be leaders of men, eradicating many existing undesirable and age-long prejudices and practices and introducing new and healthy activities. In this respect, they may do well to follow the good lead of the medical men—pensioners and practitioners—in and out of Government service, who all have been taking part in the various civic and professional activities for the benefit of the community. Each pensioner can specialise himself in some useful activity, in his locality, connected with some aspect of his profession. Veterinary public health in Municipal and Rural

areas, S. P. C. A., Animal welfare league, Band of Mercy, First aid to animals, Dairying, Animal husbandry, inspection of animals used in public conveyance, Cow protection societies and Go-samrakshana salas, Pinjra poles, Cattle fairs, shows and exhibitions and propaganda on modern lines, and demonstrations—these are some of the problems which demand the closer attention of the pensioners who can do some substantial justice to them all by virtue of their training and also time and freedom at their command. In all these and many other matters, their endeavour should be as far as possible altruistic and honorary and never with a view to grab. Opportunities created by such altruistic endeavours when they become remunerative, should be handed over to the unemployed needy man in the profession, the moment one such becomes available.

Above all, the moribund All-India Veterinary Association and its various provincial branches urgently deserve the attention of these pensioners. They are again best fitted up to shoulder this responsibility, as they are free from the care and anxieties of the men in service. If they revive the old useful activities of these organisations and meet often in Conferences and ordinary meetings, the many urgent problems can be usefully discussed and the initiative taken in the necessary directions. The men in active service cannot do this as effectively as the pensioners can. The reasons are obvious. In the absence of an organised independent veterinary profession in the country, it is the sacred duty of those who have retired, to take up the cause of these organisations. Prof. Dhakmarvala of Bombay has given a good lead in this matter. In spite of his old age, he keeps in active touch with all the aspects of the profession and posts himself up with up-to-date knowledge of every advance and progress made in the science. It is our earnest desire that all the pensioners in the profession should undertake some form of altruistic endeavour in their respective areas and thus make their education and experience really beneficial to the community and the nation.

Clinical Articles

BOVINE TRYPANASOMIASIS

BY

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Subject.—Bullock, cross Nellore, aged about 9 years was brought to the Rajampet Dispensary for treatment on 18-3-41.

History.—The animal was worked on the previous evening for baling out water from a well and was reported to be quite healthy in every respect, but suddenly during the early part of the night began to stagger, fall down, struggled for a few minutes and got up again. These symptoms were said to have been repeated 3 or 4 times during the remaining part of the night.

Symptoms.—When the animal was brought to the hospital on the next morning, the following symptoms were observed. The body was shivering, coat staring, pulse slightly accelerated, mucous membrane partially anaemic, head bent down with movements of the jaws as if the animal was making attempts to eat earth. Salivation marked. Rumination suspended with complete loss of appetite. Urine a little high coloured and the dung was normal. Temperature 103° F. Oedematous swellings which is a constant feature in the equines was conspicuous by its absence.

Diagnosis.—Blood smears were examined on the spot by the District Veterinary Officer, Nellore, who found them teeming with Trypanosomes.

Differential Diagnosis.—The symptoms in bovines stimulate those of epilepsy probably due to the Trypanosomes producing certain toxins which act upon the central nervous system and thus presenting a variety of symptoms such as going round and round which may be mistaken for *Coenuris cerebialis*. Sometimes this disease is likely to be mistaken for rabies from the presence of salivation, champing of the jaws, drooping of the head with a pretence to eat earth, but in rabies the look of the animal will be vacant and staring and drooping of the head will be absent.

Source of infection.—Infection spreads from an affected animal to a susceptible one by means of biting flies. Usually the incidence of this disease is greater during wet weather when the distribution of biting flies is widespread. In other seasons the infection is limited to the neighbourhood of rivers and other large water sources. Many animals of the local herds though they harbour the parasites in the system do not show any clinical symptoms. Calves born to such resistant mothers develop a resistance or premunity, which gets gradually increased as the calf grows into an adult in consequence of repeated infection until such time as it would be quite strong to resist the infection of the local strain. Such resistant animals may show a break-down of resistance if they are exposed to infection of a different strain of Trypanosomes and terminate fatally after showing acute symptoms or the resistance may be broken down through certain influences such as change of climate or environment, overwork, insufficient or bad food, intercurrent diseases etc., which have a tendency to lower their vitality. It is very difficult to detect the source of infection of an acute case unless the blood from all the incontact animals in an outbreak are examined and the carriers detected and eliminated by Trypanocidal treatment.

Treatment.—On 18.3.41, 5 grs. of Antimoni et. Potassii Tartaratum was given dissolved in 20 c.c. of distilled water intravenously under antiseptic precautions. Symptoms of coma were relieved by the application of cold swabs to the forehead. In about 15 minutes after this treatment, the animal looked greatly relieved and was inclined to take some interest in the surroundings. The quivering of the musculature stopped. After 3 hours, the animal ruminated, drank a small quantity of water and showed signs of returning appetite when it was taken home.

On 19.3.41, the temperature was 100° F. It was given one ounce of Pulvis Chirata as a decoction in a pint of water.

On 20.3.41, the temperature was 99.4° F. Chirata decoction was repeated.

On 21.3.41 the temperature was 101.4° F. Another injection of Antomoni et. Potassii Tartaratum was given after taking a couple of blood smears for examination. The result of the examination was that the blood was free from Tryps.

As the animal was considered to be quite healthy it was discharged cured.

Again on 1.4.41 about 12 noon, the owner of the above said animal came and reported that the animal fell down and was kicking his legs. One of us (K) went and saw the animal at his residence and found the patient almost exhausted as the result of violent struggling. Temperature was

103.4°F. Pulse accelerated. Blood smears sent were reported to contain Tryps. Injected 6 grs. of Antimoni et. Potassii Tartaratum in 20 c.c. distilled water intravenously. The animal had another attack of epilepsy after injection and the application of cold water was continued to the forehead for about 2 hours after which it got up and appeared to be improved in condition.

On 2.4.41, the temperature was 99.6°F when the animal attended the dispensary and it was given tonic powder.

From 3.4.41 to 6.4.41 the same treatment was continued.

On 7.4.41 another injection of 6 grs. of Antimoni et. Potassii Tartaratum was given intravenously.

From 8.4.41 to 12.4.41 tonic powder was continued. The Animal made an uneventful recovery and was seen on 24.4.41 to be quite healthy and doing its usual work.

From this it is concluded that relapses after one or two injections of Antimoni et. Potassii Tartaratum are quite likely. Hence 3 or 4 injections appear to be necessary at an interval of 5 or 6 days to effect a cure.

It is absolutely necessary that iron and copper supplement should invariably be added to the feed or the medicament of animals, convalescing after an attack of Trypanosomiasis in order to relieve the severe anaemia present. It is also important to add necessary quantity of bone-meal to recovering animals to make up the loss of calcium which has been found to be highly deficient during and after an attack of Trypanosomiasis.

Treatment of the herd.—The duty of a Veterinary Assistant Surgeon does not rest with the treatment of such affected animals brought to the dispensary. He has to trace the source of infection and eliminate it as far as possible from the carriers among the incontacts. Unless this is done by suitable treatment, the carriers will remain a constant source of infection and be responsible for frequent outbreaks during the fly-season. In order to achieve this object and save further deaths, a course of treatment consisting of 2 or 3 injections of Tartar Emetic at an interval of a week is found to be efficacious except in cases which have progressed to a state of emaciation. It should be remembered that buffaloes remain a potent source of infection without showing any clinical manifestation besides the other susceptible animals such as camels, sheep etc. But it is very unfortunate that treatment of the animals on a mass scale in a herd which are apparently healthy cannot be carried out owing to 2 to 3 per cent of deaths among these that are subjected to this treatment. Sometimes, the death is so sudden after injection that life is found to be extinct, soon after the ropes that were used for casting and keeping the animal under restraint for infection are released. Distressed breathing cyanotic condition of the mucous

membrane, rolling of the eye balls and a few spasmodic movements of the lower jaw followed by death are the symptoms noticed. The train of symptoms above described does not exceed $\frac{1}{2}$ to one minute from the time the needle is removed from the vein. At other times deaths were recorded from 6 to 24 hours from the time of injection. After the first death no further treatment is possible in that village since the ryots are not pleased with its performance. These casualties though small offer serious obstacle towards eradication and successful control in dealing with herds in the village. The usual dose is 5 grs. in 20 c.c. of distilled water for animals varying from 500 to 600 lbs body weight.

Toxicity of Potassii Antimonium Tartaratum.—Various reasons were put forth by many workers regarding the deaths caused after treatment with this drug.

1. During certain experiments carried out in connection with Nasal Schistosomiasis, it is stated that cause of death was found to be due to blocking of the coronary artery by a large number of dead parasites, which are released into the circulation after being killed by the intravenous injection of Antimonium Tartaratum and thus bring about sudden collapse from syncope. This does not agree with the clinical experience. If death is due to blocking of the dead parasites, then all deaths should invariably happen immediately after the first injection, since it should kill almost all the parasites. But the experience of field workers does not lend support to the view above stated, since deaths have been recorded even after 2nd or 3rd injections given at an interval of 3 or 4 days. Again deaths met with during the treatment of apparently healthy animals for the eradication of carriers in an outbreak of Bovine Trypanosomiasis disproves the above findings. It cannot for a moment be imagined that dead Trypanosomes, when killed block the coronary artery while they move about in large numbers in the minutest capillaries before being killed by injection of Antimonium Tartaratum. Further the dead schistosomes stand a better chance of being filtered or obstructed in their course in the minor ramifications of the lungs before they reach the arterial from the venous circulation. Another argument to refute the above theory is that when animal suffering from either Tryps or Nasal Schistosomes are treated with Antimosan, no deaths have so far been recorded inspite of its curative effect. Such massive doses as 8 to 10 c.c. of 3 to 5 per cent solution of Antimosan have not proved to be fatal, irrespective of the route through which it is administered whereas Antimonium Tartaratum can only be given intravenously which demonstrates its highly irritant nature. From the foregoing, it could easily be seen that it is the toxicity that is responsible for deaths acting upon the certain vital centres by elimination of certain toxins rather than mechanical obstruction of the coronary artery.

2. Another reason attributed is that boiling of Antimonium Tartaratum during the process of preparation of solution before injection renders it highly toxic by formation of certain adverse chemical changes. It is also said that overheating antimony salts in a steam steriliser leads to decomposition. As a matter of safety, it is suggested that Antimonium Tartaratum should be added to recently distilled sterilised water to which 5 per cent Glucose is added. The solution should then be brought to boil, without being over-boiled for a prolonged period. But it is not clear how overboiling renders the drug highly toxic only to certain animals and in what manner deaths are caused. This theory is also at variance with the clinical experience of most field workers for the reason that deaths have occurred even with the use of freshly made solutions prepared after first boiling distilled water to which the drug is added while hot enough to dissolve it.

3. "Old stock solutions of Antimonium Tartaratum must not be used because several fungi often develop in them and render such solution highly toxic. This explains in part, these cases of rapid death that often follow the injection of Antimonium Tartaratum." Nothing can be said either for or against this suggestion as the solution is not stocked but prepared then and there when required for use.

4. Some practitioners affirm that Potassii et Antimony Tartaratum is more toxic than Sodii Antimonium Tartaratum and is said to exert more depressent effect on the heart and the central nervous system than Sodium salt. Since the latter is not commonly supplied for use, the experience of its toxicity or otherwise cannot be definitely stated.

5. Another theory advanced by certain Veterinarians is that only a small percentage of animals present the toxic symptoms and succumb while a large number withstand the ordinary doses without any ill effects. This evidently makes them believe that certain pathological changes are produced as a result of certain intercurrent or latent diseases which render the drug more poisonous or cause a breakdown of the resistance to its toxic effect. But this explanation does not bring one very much nearer to the problem intended to be solved, since the authors of the above exposition have not stated anything in respect of the nature of the pathological changes and the manner in which such changes bring about death.

6. The following extract from the Annual Report (1938) of Tanganyika Territory will be of some interest with regard to the subject.

"It has long been known that the chief danger attending the use of Tartar emetic for the treatment of Trypanosomiasis is the narrow ratio between the toxic and therapeutic doses. The routine treatment adopted here and at many other places is a course of intravenous injections of tartar emetic at the rate of 0.2. gramme per hundredweight; a lower rate is ineffective, yet merely double this rate is very dangerous. The chief

manifestation of poisoning is acute parenchymatous degeneration of the liver.

2. The fact that the bounds of safety have been passed are quickly seen following the administration of the overdose that precipitates the degeneration. The animal does not eat from the time of treatment the next day he is intensely constipated and visible mucous membranes are jaundiced. Death usually occurs during the second night after the overdose. Recovery sometimes takes place but at best is a slow process of several weeks.

It is obvious that once a beast has shown signs that his liver has been upset with tartar emetic, further treatment must be withheld until the organs most affected have recovered. Thus, many times in our experience we have had to stop treatment in the middle of a proposed course; frequently the animal has died a day or two later, but a few have recovered.

It was the fact that a high percentage of these recovered cases did not relapse to the trypanasomiasis for which they were being treated that made us wonder whether after all the liver degeneration might not of itself be detrimental to the trypanasomes or in some way favour the drugs' action."

It was subsequently proved that liver degeneration does not in any way favour the trypanacidal action of the drug.

The cause of death recorded in the above extract does not offer any explanation for deaths that occur immediately after the first injection, among a few animals in a herd which receive the same dose like other resistant animals, though it may be a probable reason to account for deaths that occur after 12 to 36 hours after injection. Another important factor which remains unanswered is the predisposing causes for acute parenchymatous liver necrosis only in a small number of animals.

Resume. Apart from the various theories and facts enumerated it is certain that Antimonium Tartaratum is very crude in its composition so much that if used subcutaneously, sets up a severe cellulitis being a powerful irritant. This irritant drug if injected directly into the vein may produce severe shock paralysing the vital centres in certain animals, whose natural powers of resistance have been broken down by certain chronic or intercurrent disease or diseases. This problem may be said to have been solved by the use of Antimosan, which is non-toxic. But its prohibitive cost precludes its extensive use. Unless and until a cheap and non-toxic preparation of Antimonium Tartaratum, similar to Antimosan is evolved out of Antimonium Tartaratum, the eradication and control of outbreaks of Bovine trypanasomiasis would continue to be as unsatisfactory as ever,

Bibliography.

1. Annual Report on the Veterinary Department, Nigeria for the year 1938.
 2. Annual Report of Department of Veterinary Science and Animal Husbandry, Tanganyika Territory for the year 1938—Part II—Research.
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SPIROCERCA SANGINOLENTA IN A BITCH

BY

A. V. DE CROOS, G. V. Sc.,
Colombo.

Subject.—A white Bull terrier bitch about 4 years old, in fairly good condition, suspected by the owner to be rabid, was brought to the Dog Pound on 31-3-41.

History.—The owner stated that the bitch was unable to retain any food. Had a cough and was continually retching. The animal was kept under observation at the Dog Pound—it could not retain any food, cough was slight and retching very pronounced. Temperature normal. Constipation marked. Rabies ruled out.

Faeces were examined very minutely. Ova of *Spirocercia Sanguinolenta* found in faeces together with *Ankylostoma Caninum* and *Toxicara Canis*. Blood films taken and examined, gave negative results for Piroplasms and Trypanosomes.

Diagnosis.—*Spirocercia Sanguinolenta* infestation probably in the digestive tract with infestation of *Ankylostoma Caninum* and *Toxicara Canis*. The owner was advised that treatment would be of no avail and the best course would be to destroy the bitch. He, however, requested that experimental treatment be given with a view to finding whether it would be possible to affect a cure. Although it was known that the best treatment could only be palliative, treatment was undertaken, more with the purpose of watching the course of the disease and the effects of anthelmintics rather than with the hope of any permanent cure.

Treatment.—

April 3rd—Soap and warm water enema given. Ordinary worm oil administered. The bitch had several motions and appeared relieved.

April 4th—2 c.c. Antimosan by intra-muscular injection. In the evening animal started taking food and retained a small portion of it.

April 5th—Animal passed no motion and refused food. Enema given. Sample of faeces examined. *Ankylostoma Caninum* and *Toxicara Canis* found, but no *Spirocercia Sanguinolenta*.

April 6th—2 c.c. Antimosan intra-muscular with Anthelmintic mixture. Bitch began taking food retaining a fair quantity. Retching decreased.

April 8th—Continued treatment of the 6th. Dog vomited and could not retain any food.

Vomit examined.—A small portion of worm found but classification difficult. It was observed that the bitch was losing condition.

April 9th.—Anthelmintic mixture containing Carbon Tetrachlor given. Bitch had a few motions—loose and offensive.

April 10th.—2 c.c. Antimosan given intramuscularly. Food taken but not retained.

April 11th.—5 Minims Chlorotone was tried 15 minutes before feeding. Bitch did not vomit. Treatment was continued till April 24th—2 c.c. Antimosan on alternate days and chlorotone daily. The bitch continued losing condition. Vomiting had practically ceased but there were occasions when retching was marked. Constipated. Enemas given to relieve this condition.

April 26th.—Anthelmintics with Carbon Tetrachlor given.

April 28th.—Animal in a very weak condition and vomiting started again. Anaemia marked. Blood transfusion was tried. The dog showed slight improvement for two days after blood transfusion but lapsed into its weak condition on the third day, so blood transfusion was resorted to every fourth day. The bitch made no progress and continued to grow weaker and weaker. Respirations were difficult and painful and retching pronounced. On 21st June it died of exhaustion and severe anaemia. It was far too weak for anthelmintic treatment, stimulants only were given during the latter period.

Post Mortem.—Digestive tract was first examined. Oesophagus showed tumours in the anterior part from which the worms were protruding. One tumour opened and a nest of worms found. No worms found in the pyloric or cardiac orifices. The rest of the carcass was markedly anaemic. Diagnosis confirmed.

Observations.—In the early stages of the disease Antimosan caused some relief but later on had no effect. Carbon Tetrachlor had no effect. The same may be said of the other anthelmintics tried. The animal was probably kept alive for so long a period by the blood transfusion and the several injections of Antimosan. Noticeable features of the disease were, loss of condition, the desire for food and the inability to retain it. Temperature normal throughout. When diagnosis is confirmed by the finding of ova or worm in the faeces or vomit, the most humane course is destruction of the animal as no anthelmintics seem to have any effect on the worms.

It would be of interest to dog owners to know that the larval form of the worm exists in the stomach of the cockroach, mice and rats and is also found in fowl dung. These are probably the chief sources of infection.

FOWL POX

BY

H. K. NAG CHOUDHURI, G.B.V.C.,
Veterinary Assistant Surgeon, Patharkandi, Assam.

Recently I had an opportunity of attending an outbreak of Fowl pox in a small poultry farm containing 22 fowls. Four fowls were attacked and three died and subsequently the disease subsided.

Symptoms.—Two birds were the first victims. They showed typical skin lesions in the head and comb. The skin eruptions were small in size but abundant. They coalesced and appeared like scratches with scabs over them. Besides, mouth lesions in the form of diphtheritic membranes were present. They were diagnosed as clinical Fowl pox cases. The third fowl that contracted the infection showed no skin lesions at all but false membranes were observed in the mouth. The fourth and the last affected fowl showed only eruptive lesions in the head but no mouth lesions. This bird recovered after a short period of illness.

Post-mortem findings.—Buccal cavity contained whitish or dirty white cheesy deposit and pieces of false membrane. Rare minute ulcers were seen in the mucous membrane. Intestines showed small inflammatory patches. A few Nematodes (*Ascaris*) and one Cestode (*Davainae*) were also found in the intestines. Otherwise there was nothing unusual in the vital organs.

Conclusion.—The points of interest in this outbreak are that:—

- (1) The first two cases started with both comb and mouth lesions.
- (2) The third one developed only mouth lesions.
- (3) The fourth one manifested skin lesions only.
- (4) Although all the fowls were in contact no further bird was affected.

The clinical manifestations were of a changing nature in the affected birds which latterly showed either comb or mouth lesions. It is held by some observers that the virus present in the false membranes in the mouth is in considerably lower concentration (due to the presence of secondary organisms) than in the skin lesions of the comb. It seems probable that the severity of the outbreak had become much reduced and hence the remaining birds escaped infection.

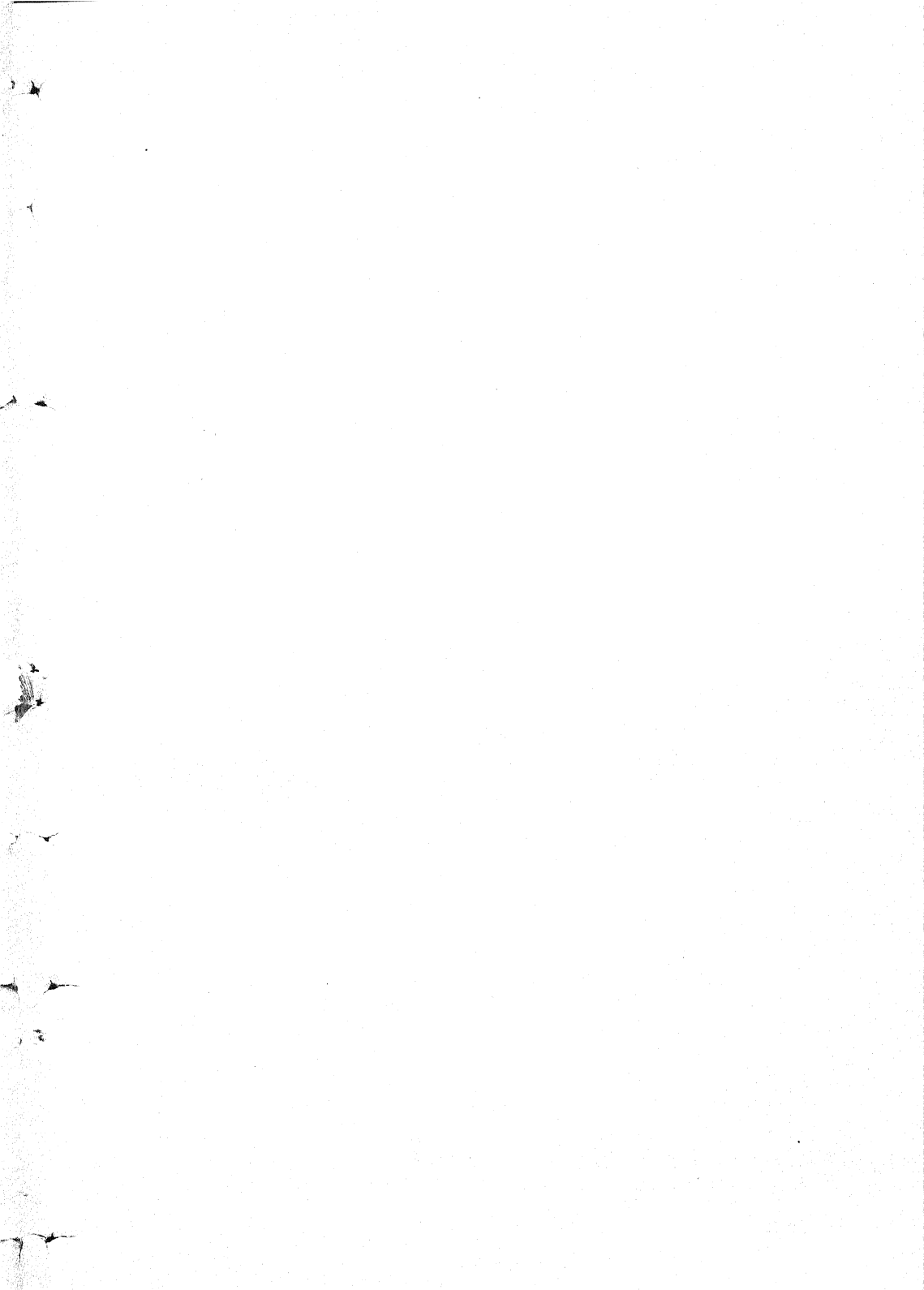




Fig. 1.
Photo of a calf suffering
from deficiency of
vitamin A and D.

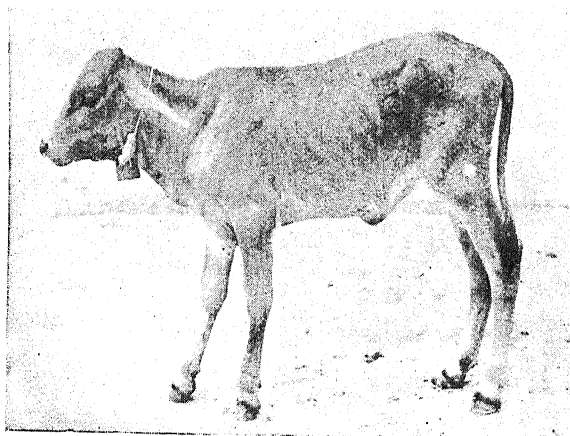


Fig. 2.
Photo of the same calf
after a month.

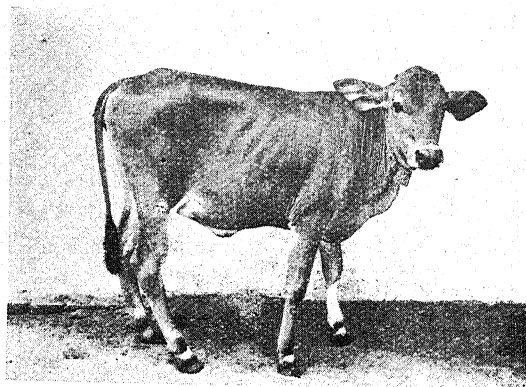


Fig. 3.
Photo of the calf after
6½ months after the treatment.

SUCCESSFUL TREATMENT OF A NEWLY BORN HEIFER CALF WITH SHARK LIVER OIL FOR VITAMIN DEFICIENCY

BY

J. D. DAVID, G.M.V.C., (P. G. EDIN.)

AND

K. M. YAKUB SHAH, G.M.V.C.
Coimbatore, Madras.

On 23rd September 1940 a heifer calf (1/4 Ayrshire Scindhi calf) was born to Ayr. Sc. F., cow No. 348 of the Agricultural College Dairy, Coimbatore. The calf was delivered with help. The calf was unable to extend both the fore feet and hence supported the legs with the fetlocks on the ground and the other joints below in a completely flexed condition. The back tendons looked contracted and undeveloped and the joints bent and stiff. Being a heifer calf it was decided to try Cod-liver oil treatment suspecting that the animal had deficiency of vitamin A and D. (Please vide photo No. 1, Plate No. 8)

The calf weighed 46 lb. on 24th September 1940. Treatment began immediately as follows:—

Soft splints were applied to the joints below the fetlocks and the animal supported to stand on its feet; but she was able to use only the toes, even with the supporting splints. The splints were removed daily and shark liver oil was rubbed on the joints. Internally a tablespoonful of the same was given. The legs gradually improved and by 21st October 1940 the animal was able to move about without splints. The calf now weighed 64 lb. (Please vide photo No. 2, Plate No. 8)

On 22nd October 1940 the calf developed tympanitis and was under treatment again till 31st October 1940. On 1st November 1940, the weight of the calf was 64 lb. The shark liver oil treatment was continued internally in half an ounce doses a day and increased to half an ounce twice a day. The calf improved immensely in condition and weight, and the weight of the calf was 164 lb. on 9th April 1941. (Please vide photo No. 3, Plate No. 8)

Shark liver oil contains a high percentage of vitamin A and hence this article is written to prove its efficacy. The cow of the calf concerned died and was proved to be suffering from John's disease. There is a possibility of a low supply of vitamin to the calf in its intra uterine existence as the cow had been low in vitality.

I am using shark liver oil on my canine patients with success and without any bad effects.

SARCOSPORODIASIS IN CATTLE

BY

MUHAMMAD RAHIMUDDIN, G. M. V. C.,

Veterinary Assistant Surgeon, Veterinary Hospital, Adoni.

Introductory Remarks:—Out of 3300 postmortem examinations conducted on Bovine Carcasses (2700 white cattle and 600 buffaloes) in the year 1940-41 in the Municipal Slaughter House Adoni, Sarcosporodiasis was noticed in two Bovines and 160 buffaloes. During life, the affected animals did not show any signs of ill health. During the year, 16000 carcasses of sheep and goats were also examined but this protozoa could not be found in them. This may be due to its smaller size and the predilection sites being the muscles of the thighs and the heart.

Sarcosporodiasis is a condition produced by a parasitic protozoa under class sporozoa affecting the muscular and connective tissues. It has no Cilia or Flagella; but the Flagella occurs in the adult male element. They ingest liquid food by osmosis and cause apparently no ill health to the hosts. Life cycle is still obscure. The Sarcocyst in the muscle is the only stage of the parasite known.

Description of the Parasite:—They are elongated parasites found in the muscular fibres of mammals, the average size and the colour of the cyst being about those of the seed of a cucumber. In the infested gullet they are easily visible to the naked eye during meat inspection below the Serous coat of the organ (not superficial) and there will be no difficulty to differentiate the affected organ from a normal one. Some gullets were heavily infected while in others the cysts were scattered here and there.

As per Wooldridge the disease may give rise to symptoms of anaemia, emaciation, general unthriftiness, sometimes difficulty in respiration and oedema of the glottis, but in many cases no symptoms whatever are exhibited. It occasionally occurs in the form of an epizootic:—

From the writers observation the following facts were noted.

(1) In white cattle a very small percentage was affected with this parasite.

(2) About 25% of buffaloes were found to be affected with this parasite. This fact gives rise to a query if the aquatic living nature of these animals has some bearing on the percentage of infection.

(3) The parasites were noticed only in the muscular tissue of the oesophagus—probably the most favourable seat of its predilection.

(4) The object of recording this note is that the buffaloes appear to be susceptible and the seat of predilection of the parasite was found to be the gullet.

My humble thanks are due to the Principal of the Madras Veterinary College for kindly identifying the Parasite and to Mr. P. K. Devanayakam, G. M. V. C., District Veterinary Officer, Bellary, for his suggestions to write this note when he had come to this station for the inspection of the Hospital where a specimen of Sarcosporodiasis in buffalo is preserved. My respectful thanks are also due to the Director of Veterinary Services, Madras, for improving this article by giving further instructions.

FACIAL PARALYSIS IN A BULLOCK

BY

K. S. PRAKASA RAO, G.M.V.C.,
Veterinary Asst. Surgeon, Bezwada.

History.—One Ongole Bullock, aged 8 years, admitted as In-patient, case No. 1792, was brought from Vennemekala Agraharam of Gannavaram taluk with a history that cud had been accumulating at the right cheek and that there had been a wound in the ear on the same side which was fly-blown some 8 days previously.

Predisposing factors.—There were ticks thinly distributed all over the Body of the animal.

Symptoms.—The right ear was drooping down without movement. There was a wound in the ear which was fly-blown. The cheek on the right side was prominent with accumulation of cud at the cheek. The eye was semi-closed. There was no movement of the eye-lids. The cornea was without usual lustre. The haw of the eye was powerless. There was accumulation of mucous at the inner canthus. During the act of rumination the fluid portion of the cud was flowing out of the mouth. The right nostril appeared to be contracted. It was drawn to the left side presenting a deformed appearance. When water was offered, the animal immersed its muzzle to the bottom of the bucket and attempted to sip in vain. Most of the water came out of the mouth.

Diagnosis.—It was diagnosed as facial paralysis.

Treatment.—2 per cent solution of Trypan blue was boiled and filtered. 40 c. c. of the filtrate was given as an intravenous injection. Liniment of ammonia was rubbed over the cheek and around the affected year. Eye ball was irrigated with 1 per cent solution of saline. Maggots were removed from the wound in the ear and fly repellent dressing applied.

From next day onwards, the above treatment was continued, except Trypan blue injection. On the 4th day, the animal began to shake the ear, move the eye-lids and chew the cud without allowing the fluid portion of the cud to escape. There has been gradual improvement ever since. The same treatment was repeated till 18-11-40, when, another 40 c. c. of 2 per cent solution of Trypan blue was given as an intravenous injection. The animal was given local treatment till 30-11-40, when, it was discharged cured.

A PECULIAR CASE OF CALCIUM DEFICIENCY IN A COW

BY

S. A. SASTRI, G.M.V.C.,

Veterinary Asst. Surgeon, Ootacamund.

Subject.—A cross-bred cow, six years old.

History.—Calved normally but had a uterine discharge for two weeks, which ceased after the usual antiseptic douches.

On 22-11-40, three weeks after calving, at the request of the owner, I saw the cow and noticed the following symptoms.

Every half an hour the cow was jerking forward its left hind leg and doing it continuously for 5 minutes. Simultaneously the whole body became rigid, back arched — eyes rolling and head dashed forward until it reached the wall. It was kept in that position for 2-3 minutes and then the animal threw itself down and began to stretch its body and limbs and grind its teeth with a groan. There was no discharge from the uterus and it had contracted well. Examination of blood smears and dung revealed nothing abnormal.

Treatment.—Gave an enema and a vaginal douche with potassi Perman-ganas lotion. Internally a pint of linseed oil with half an ounce of Chloral Hydras, and Pot. Bromide was administered.

23-11-40. The cow had two motions in the morning. But the symptoms were more severe and they appeared every 15 minutes. It occurred to me that calcium deficiency might be the cause of the complaint and therefore gave the following injection subcutaneously.

R_x—

Calcium Sandoz	3 VI
Acid boric	3 I
Aqua Distilata	3 VI

The powders were mixed and boiled, cooled and filtered. After the injection, the animal did not have any of the nervous symptoms exhibited on the previous days. There was no recurrence of the symptoms and an enquiry about a month after elicited that the cow was quite fit and well.

UNDIAGNOSED SKIN DISEASE IN HORSES

BY

V. D. RATNAM, G.M.V.C.,

Veterinary Assistant Surgeon on Glanders Duty, Madras.

Four horses belonging to H. E. the Governor's Bodyguard Madras, had the following skin lesions. The back and the saddle places were filled with small nodular formations ranging in size from that of an ordinary playing marble to that of a small pea. Each of them had a pin point ulcer-like lesion in its centre, with induration of the surrounding parts.

The nodules were only in the skin and they were not attached to the structures underneath. There were from 400 to 500 of these nodules.

The disease did not appear to be contagious as the animals which were in contact with these horses did not develop this trouble. As a rule, there was no pruritis nor was there any alopecia. When viewed from a distance, it looked as if a number of small marbles were imbedded under the skin. No saddle could be put on as it made the animals very uncomfortable.

The complaint was a long standing one. One animal had it for 3 years; another for 2 years, while the other two for one year. Scrapings, blood-smears from the serum-like material obtained from the squeezing of the nodules, and skin sections of the lesions were all negative for any organisms. The examination of these materials was conducted on several occasions with the same negative result. The Principal, Madras Veterinary College reported that the examination of the skin lesions revealed no microfilaria, but, however there was evidence of oedema cellular infiltration of the tissue. Many drugs were tried such as sulphur, arsenic, calcium, iron, iodum, iodides, Mag. Sulph, etc., in the form of injections and mixtures; externally dressings of Mercury, Sodium Hypo Sulphate, Glacial Acetic Acid, Sulphur, Oium Picis, etc., were tried. But none of them had any effect on the lesions. Finally the following dressing was used externally with excellent results:

Kerosene Oil	1 oz.
Sulphur Sublimatum	1 „
Turpentine	1 „
Cod-liver oil or Fish Oil	2 „

Internally Calcium Sulphide 30 gr. in feed daily was given for a month.

The animals improved marvellously, the skin became normal and the horses are now doing their normal work.

Since trying this preparation on these cases, it has been freely used for various other skin diseases in cattle and dogs and the results have always been very satisfactory. Incidentally it may be mentioned that dressing was also found very effective in eradicating ticks and lice.

CAN THIS BE P. GIBSONI?

BY

K. S. SHETTY, G. M.V.C.,

I/c Veterinary Dispensary, Narayanaguda, Hyderabad-Dn.

Subject.—Fox terrier dog, weighing about 30 pounds, aged four years admitted as outpatient on 20-5-1940.

Previous History.—Bleeding profusely from the left nostril on and off for about four months. Did not thrive inspite of good nourishment. Used to be exhausted with slight exertion. Never refused nourishment.

Symptoms Observed.—Faeces and blood were examined microscopically and found negative, but the urine was positive for albumen in fair amount, a few pus cells, epithelia and kidney cells. The dog was kept on non-meat diet and treated with Helmitol for nearly a month with no improvement. Epistaxis recurred now and then ; urine showed even granular casts, R.B.C., bile and plenty of pus cells on further examination. In the first week of August, oedema appeared first in one of the hind limbs. In a day or two it appeared in the other limb gradually the fore limbs were involved and then the face. In the first two weeks the Oedema used to disappear temporarily from some parts and then appear again. But later on it persisted, and discharges were noticed from the oedematous swellings in the hind limbs. In the middle of August the chest on both sides became highly inflamed and after a few days an abscess was formed on the right side and burst out with profuse purulent discharge which continued for a long time and the wound had no tendency to heal at all. The dog's condition became poorer day by day. In the beginning of September suddenly the dog became completely blind owing to exudate in the retina of both the eyes. (Albuminuric Neuroretinitis)—the cause attributed by the Ophthalmist after acquainting himself with the urine reports was Nephritis. The dog began to sink day by day and on 17th September he was put off painlessly with chloroform as requested by the owner. Since the case was an interesting one some parts of the Viscera-Heart, pieces of Liver, Spleen, both the kidneys and Bladder were forwarded to the Imperial Veterinary Research Institute, Mukteswar, for Histo-Pathological examinations with a brief history of the case. But unfortunately I was informed that no Histo-Pathological examination could be conducted owing to the material not being in a fit state but the history of the case was typical of a P. Gibsoni infection.

Association News

THE INDIAN VETERINARY JOURNAL

(Vol. XVII)

Statement of Receipts and Payments for the year ending 30th June, 1941.

<i>Receipts.</i>		<i>Payments.</i>	
	Rs. A. P.		Rs. A. P.
To Opening Balance	2,674 2 9	By Rent	480 0 0
" Subscriptions	4,395 5 0	" Salary	480 0 0
" Advertisement	498 15 0	" Honorarium	1,000 0 0
" Sale of Reprints	97 8 0	" Journal printing charges	1,027 11 0
" Interest	75 0 0	" Railway freight	0 8 6
" V. P. Postage recovered	48 15 0	" Binding Charges	26 4 0
" Miscellaneous	6 8 3	" Postages	910 10 0
		" Printing & Stationery	25 0 3
		" Repairs to Typewriter	34 4 0
		" Commission on Cheques	3 6 0
		" Audit Fee	25 0 0
		" Closing Balance	3,183 10 3
Total	... 7,796 6 0	Total	... 7,796 6 0

Examined and found correct.

20, Thambu Chetty St.,
Madras, 30th Aug. 1941.

K. GOPALKRISHNA RAO,
Registered Accountant.

Extracts

SHOULD CROSS-BRED BULLS BE USED FOR BREEDING? Examples from Other Countries

BY

M. CRAWFORD, M.R.C.V.S.,
Colombo, Ceylon.

(Deputy Director of Agriculture, Animal Husbandry)

To the orthodox cattle breeder in Great Britain the above question has only one answer and that is "No". To suggest the use of cross-bred bulls to cattle breeders in Great Britain or America would be to lay oneself open to a charge to heresy!

For the breeder who is dealing with any particular breed of cattle, be the Shorthorns, Freisians, Ayrshires, Scindis, Hissars, Sinhala, or any other, the cross-bred bull can have no place in his scheme of operations. The same applies to the breeder who is attempting to grade up an inferior herd to some predetermined standard. In both these cases pure bred bulls, and the best pure bred bulls obtainable, must be used. The reader at this stage will probably ask: "Why then is the question propounded?" It may be made clear that in this note I have in mind a particular type of cross-bred bull and that is a bull which is a cross between one or other of the improved breeds of cattle from the Temperate Zone and some breed or type of tropical cattle. I do not necessarily restrict consideration to a bull which is the first cross between these two types, but would include bulls which have in their make-up a combination in varying proportion of the characteristics which distinguish Temperate Zone cattle from Tropical cattle.

When improvement of cattle in India, Ceylon and other Tropical countries was first taken in hand by European workers, the most obvious method to try was crossing the cows with bulls of the best European breeds imported from Europe. In nearly all cases the first difficulty encountered was the problem of keeping the imported bulls alive long enough to leave any considerable number of progeny behind them. This was on account of the high degree of susceptibility of imported European cattle to diseases peculiar to Tropical countries. At that time very little knowledge was available of these Tropical cattle diseases and losses of bulls imported at considerable expense were heavy. The general experience was that the first generation of cattle produced by mating cows of the Tropical breeds to imported European bulls were a great improvement on their dams. So striking was the improvement that the earlier workers were encouraged to persist in spite of heavy losses from disease among the imported bulls.

Hopes Not Fulfilled

As time went on and more knowledge was gained of Tropical cattle diseases European bulls could be imported with much greater certainty that they would survive. The bright hopes entertained by the earlier workers

based on the excellence of the first generation of cross-bred cattle were not fulfilled when the process was carried further and the second, third and fourth generations of cattle sired by imported European bulls became available. The natural expectation was that succeeding generations with increasing proportion of the blood of the better European breeds should show continued improvement and closer approximation to the standard which the improved breeds had attained in Europe. But the general experience was that as the proportion of European blood increased there was a progressive decrease in the stamina of the cattle.

The 2nd 3rd and 4th generations instead of showing improvement on the 1st generation proved to be inferior. Exceptions to this rule have occurred when the cattle are kept at high elevations, but speaking generally the evidence is convincing that in really Tropical areas grading up of local stock or some European breed is not advisable. Even in places where it has been possible to establish effective control of Tropical diseases results have been unsatisfactory on account of the high temperature and humidity.

The rebound from early expectations has in some countries led to the conclusion that European cattle cannot play any part in the improvement of Tropical cattle and that improvement must come as a result of selective breeding from the purely Tropical breeds. This view has, for example, been accepted in India and the policy of the Government of India is that bulls of European breeds shall not play any part in their schemes for improvement of cattle in India.

In other places and particularly in places where the introduction of cattle of European breeds had proceeded to a much greater extent than in India, it has been recognized that deterioration in the stamina of such European cattle was such a serious matter that the process could not be carried any further. The remedy for that state of affairs was sought by the introduction of the blood of one or other of the better breeds of Tropical cattle. Breeds for that purpose were sought in India and we have seen bulls of such breeds as Ongole, Sahiwal, etc., being purchased in India and transported to Brazil, Texas, the West Indies, and the Tropical parts of Australia. On account of the great expense and more especially because of obstacles raised by quarantine and other regulations the number of Indian bulls taken to these countries has been very small. Marked improvement in the stamina and resistance to Tropical conditions of cattle of European breeds was obtained by the introduction of the blood of Indian breeds.

The improvement of stamina was very satisfactory but as the proportion of Indian blood was increased there was naturally a closer and closer approximation to the characteristics of the pure Indian cattle. That often meant a lower standard of milk production and of beef qualities as compared with pure European breeds. On account of this and also on account of the expense and difficulty of getting sufficient numbers of bulls of pure Indian breeds some breeders were forced to experiment with bulls of mixed European and Indian ancestry. The object in view was to produce a type of cattle which would combine in a stable form the desirable qualities of both the Indian and the European types; in other words, to evolve a new breed which would breed pure and which would have the ability to withstand Tropical diseases and Tropical conditions of climate and would retain

the valuable economic qualities of the European breeds either as regards high milk production or beef characteristics, as the case might be. Theoretically it should be possible to develop a true breeding type starting with cattle of mixed European and Tropical ancestry on both sides.

Some evidence that the theoretical possibilities can be achieved in practice is beginning to accumulate. The evidence is not yet very extensive nor based on very long experience but is of very considerable interest to Ceylon.

Limited Number In Ceylon

In Ceylon the number of pure bred bulls of either European or Indian breeds is still very limited. Crosses between these types are more plentiful and the question has been put to me not infrequently recently. Could such bulls be used in an effort to evolve a new type or breed? It is therefore, of value to consider here such evidence as does exist.

In the Year Book of the Cattle Breeders' Association for 1939 there is an article by Dr. Hammond of Cambridge in which he gives examples of how degenerate types of European cattle have been improved by crossing with bulls of Indian breed. The examples which he cites in that article come from Jamaica. From Jamaica also come examples of improvement of the same type of degenerate European cattle by crossing not with pure Indian bulls but with bulls of mixed European and Indian breeds.

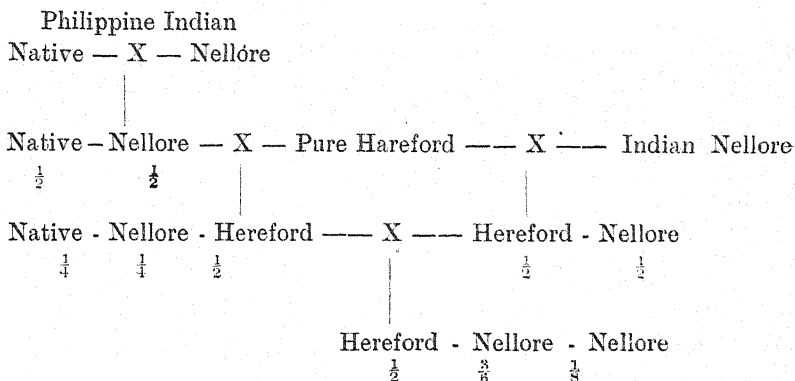
Further examples are given in an article in "The Philippine Agriculturist" by Miguel Manresa (Volume XXVIII, November, 1939 Number 6). He describes what has been named the Santa Gertrudis breed evolved on a ranch in Texas with a sub-Tropical climate. For 35 years the ranch had been stocked with pure Shorthorns and Herefords with frequent introductions of new bulls from North America and England. In spite of these frequent importations the size and type of the cattle degenerated and fertility declined steadily. The stock in the ranch numbered 50,000, a number sufficient to give a good chance of finding individuals which were adapted to the conditions, but none such came to light.

The mating of a cross-bred bull in which Nellore blood predominated with a herd of pure-bred Shorthorn cows gave such good results that it was decided to go further on these lines. One outstanding bull named "Mönkey" was produced in the early stages and was extensively used in the herd. He was used on half bred Shorthorn-Nellore cows. Rigid selection was started among the progeny and as a result it is claimed that a distinctive breed named the Santa Gertrudis has been evolved and is now being bred in many parts of the Southern States of America where pure European cattle had proved unsuitable.

He also cites experience at "Glen Prairie" in the Northern Territory of Australia which has a Tropical climate. At this place results with pure European breeds were so disappointing that Indian bulls and also bulls of the Santa Gertrudis breed from Texas were imported. The object at "Glen Prairie" was to establish a type which would have more than $\frac{1}{4}$ Indian blood but rather less than $\frac{1}{2}$.

SHOULD CROSS-BRED RULLS BE USED

Another example quoted is the formation of what has been named the Philamin breed in the Philippine Islands. In the production of this breed cross-bred Nellore Hereford bulls were used. The scheme of breeding used is of interest and is reproduced.



Having reached that stage no pure Hereford, Nellore nor native bulls were used again.

A Distinctive Type

The best bull of that breeding was mated to selected cows of the same type. The process was continued and it was claimed a distinctive and useful type has been evolved.

These examples will be of interest to Ceylon cattle breeders and indicate the possibility of combining in one breed the characteristics of such widely differing types as Tropical and European breeds.

To come back then to the question asked at the head of the article: Should cross-bred bulls be used for breeding? The answer one would give would be a very decided "No," in so far as breeding a herd of any definite pure breed or grading up a mixed herd was concerned.

The breeder who is interested in an attempt to evolve or manufacture a new breed of cattle combining the qualities of Tropical and European cattle could begin operations using a selected bull of mixed ancestry.



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General Articles

PHENOTHIAZINE — A REMARKABLY EFFICIENT ANTHELMINTIC*

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Introduction

As the result of a publication by E. F. Knipling in April 1938, reporting the extraordinary efficiency of internal treatment with small doses of phenothiazine for preventing the development of hornfly larvae (*Lyperosia irritans*) in the faeces of cattle, a brief trial on pigs was carried out at this laboratory in order to ascertain whether the drug might not also possess a marked anthelmintic action.† The experimental pigs used for this purpose were not very heavily infected and as the efficiency of the drug, as indicated by this trial, only proved to be between 0 per cent and 60 per cent nothing further was done until August, 1939, when news of the success of Australian workers reached us and a private communication was received from W. E. Swales giving an account of remarkably good results obtained by him in Canada for the elimination of worms from comparatively lightly infested sheep.

* (Reprinted from *The Veterinary Record*, Vol. 52, No. 36, September 7, 1940).

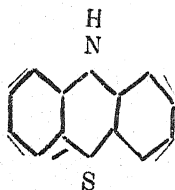
† The phenothiazine used on this and on a later occasion was very kindly supplied by the Imperial Chemical Industries workers on insecticides at Jealott's Hill. At that time the drug was difficult to obtain and without their help our early trials might have been considerably delayed.

Fortunately, we were aware of a severe outbreak of parasitic gastritis within 20 miles of the laboratory at that time and still having in our possession a certain amount of phenothiazine left over from the previous trial in pigs were able to carry out an experiment forthwith, on heavily infected sheep. This trial produced a surprisingly good result and on reporting our findings to the Helminths Committee of the Agricultural Research Council it was decided that the Council should be asked to purchase some 500 pounds of the drug for the purpose of carrying out an extensive trial under farming conditions as speedily as possible.

The symposium of which this paper forms part, deals with work carried out in various parts of the country and co-ordinated through the Agricultural Research Council.

History of Phenothiazine

Phenothiazine is described by De Eds *et al.* (1938) as "a fine, smooth powder having a pale, lemon yellow colour, and is practically tasteless. When allowed to crystallize from solutions of alcohol, benzene, xylol, or toluol, flat leaf crystals with a soapy feel are formed. Phenothiazine melts sharply at 180°C., is soluble in fat solvents, but is practically insoluble in water. It has a molecular weight of 199.14, and the following structural formula :—



"When exposed to air and moisture, phenothiazine slowly undergoes spontaneous oxidation. It is the parent substance of a large number of dyes, the most important of which, as regards the present work, are the three thiazine dyes, thionol, Lauth's violet, and methylene blue." It was first prepared in 1885, by Bernthsen, but does not appear to have found any special uses nor was there any evidence of its parasitocidal properties until 1934, when Campbell *et al.* reported on its toxicity against culicine mosquito larvae. These trials showed it to be even more toxic than rotenone, its action proving to be quite effective down to a dilution of 1 : 1,000,000.

Smith, Munger and Siegler (1935) then tried it for the control of the codling moth and found it to be as effective as lead arsenate. Knipling (1938), however, was the first to report its marked action against parasites of domestic animals ; he fed small amounts to cattle and found that whereas

no toxic effects were observed, the development of hornfly larvae (*Lyperosia irritans*) was completely inhibited in the faeces for three days. Harwood, Jerstad and Swanson (1938) then tried phenothiazine in pigs and found a rather variable, but nevertheless marked action not only against ascarids but also against oesophagostomes. Harwood, Haberman and Jerstad (1939) later reported observations on eight sheep, in which they found marked anthelmintic action at a dose rate of 1 gramme per kg. body weight, against hookworms and nodular worms and also against *Haemonchus* and *Ostertagia*, the effect apparently being particularly marked against *Ostertagia*. Swales (1939) next reported results obtained in the treatment of ten lightly infected sheep; he perfected an effervescent tablet and found a dose of 0.6 gramme to 0.8 gramme per kg. body weight to have a very pronounced action against stomach worms, nodular worms and hookworms. Gordon (1939) in Australia, also published a note having found a dose of 0.2 gramme per kg., to have a variable efficiency against nodular worms, ranging upto 100 per cent. Along with Whitten (1939), he also published a short note reporting an efficiency of 100 per cent against *Haemonchus*. Concurrent with this publication came one from Roberts (1939), another Australian parasitologist, who reported observations on seven lambs in which a dose of 0.2 gramme per kg. was shown to have an efficiency ranging up to 94.7 per cent against nodular worms and more recently Swanson, Harwood and Connolly (1940) have reported trials in pigs in which they found doses of phenothiazine ranging from 5 grammes to 30 grammes, according to the size of the pig, to be very effective against nodular worms and ascarids, although less effective against light infections of ascaris than against heavy ones.

The results reported by the present authors concern more extensive trials on larger groups of animals most of which were actually suffering from helminthic disease at the time that the trial was carried out. Sheep and horses have been most largely used and results, almost without exception, have been extraordinarily good.

The phenothiazine used in these observations has been supplied by the Imperial Chemical Industries in four forms; (a) pure phenothiazine powder, having a purity of about 99 per cent; (b) phenothiazine powder mixed with a wetting agent to facilitate its mixture with water; (c) liquid phenothiazine, being a suspension of very finely powdered phenothiazine in water containing some dispersing agent, and (d) phenothiazine tablets, containing 5 grammes of the pure drug and a certain amount of excipient together with a substance that brings about a rapid disintegration of the tablets when placed in water.

Experimental Data Sheep

ANTHELMINTIC EFFECT.

Experiment No. 1.—Eleven lambs, badly affected with parasitic gastritis were purchased from a flock among which fifty had just died from this disease. On reaching the laboratory they were divided at random into two groups, five being kept as controls and six receiving 15 grammes of the phenothiazine mixture recommended by Swales.*

All of the lambs, controls as well as treated animals, were killed five days after the dosing had been carried out and worm counts were made on the stomach and intestinal contents. Results given in Table No. 1 show a very remarkable effect of the treatment in that no worms were recovered from the stomachs of the six treated lambs, mature *Ostertagia* and *Trichostrongylus* having been completely eliminated, whereas four of the five controls contained over 15,000 worms in the fourth stomach. The effect on worms in the small intestine was less striking but nevertheless demonstrated an efficiency of over 80 per cent.

Experiment No. 2.—When the outbreak of parasitic gastritis among the flock from which the above-mentioned eleven lambs had been purchased began to diminish, and deaths occurred less frequently, forty of the most severely affected of those still remaining alive were picked out for a further trial. They were divided at random into two equal groups, one of which received four weekly doses of phenothiazine, the other being kept as a control group.

Samples of faeces were collected for the purpose of making a composite count, and all of the lambs were weighed on each of the four occasions when dosing was carried out. Particulars are set out in Table III and demonstrate the effect of the drug during one month in bringing about an increase in weight of 2.2 lb. per head over and above the gain in weight of the untreated controls.

Experiment No. 3.—Concerns an outbreak of parasitic gastritis among a flock of 91 lambs of which 36 had already died before the experiment began.

*Swales recommended a special mixture of phenothiazine of the following composition :—

Commercial phenothiazine (pulv.).	... 80 parts
Starch (pulv.).	... 9 "
Effervescent salts (sod. bicarb. 50 parts, dehydrated tartaric acid 45 parts)	... 9 "
Dried ox gall	... 2 "

The opportunity was afforded at the time that the diagnosis was made of examining the contents of the stomach of one of the lambs which had died of parasitic gastritis, and the infestation was found to comprise 20,750 *O. circumcincta*, 4,550 *T. axei* and 220 *H. contortus*.

The flock was then divided at random into two equal groups of 28 lambs; members of one group being given a dose of 20 grammes of phenothiazine in the form of a draught, without the additional substances used by Swales and the other group were kept as an undosed control. Weights and composite egg counts were made on the first and on two subsequent occasions and are shown in Table IV.

The result obtained in this observation was very remarkable in that the dosed sheep made an increase of 12 lb. per head over and above the increase in weight of the controls during the six weeks of the trial, representing a total increase of 336 lb.

Experiment No. 4.—There had been several deaths from parasitic gastritis among this flock during an outbreak of the disease which had occurred some twelve weeks previously. A *post-mortem* examination carried out at that time had shown the following parasites to be present; 23,940 *O. circumcincta*, 1,330 *T. axei* and 1,330 larvae in the stomach, and in the small intestine, 20,640 *T. vitrinus*, 1,290 *C. curticei*, 430 *C. oncophora*, 5,160 *N. filicollis* and 2,580 larvae. About 20 lambs had died and the remainder of the flock made a more or less satisfactory recovery before the test dosing was carried out on October 31st.

On this occasion the 30 poorest lambs were taken out of the flock of 400; these individuals were then selected in order, proceeding from the poorest to the best member of the group; two out of every three were dosed with 30 grammes of phenothiazine in the form of capsules, and the third was kept as an undosed control: all were weighed. The results, which are given in Table V, show an average increase during the three weeks observational period of 2.1 lb per head among the treated lambs, over and above the average increase per head of the undosed lambs.

Experiment No. 5.—K. D. Downham of the Harper Adams Agricultural College reported an observation on eight lambs suffering from parasitic gastritis in which during the first six days after treatment the four dosed lambs made an average gain of 5.5 lb. each, whereas the four undosed controls made an average gain of only 1.5 lb.

EFFECT OF THE DOSING OF HEALTHY BUT INFECTED LAMBS.—The following few observations were carried out on healthy lambs to ascertain whether the removal of a relatively slight infestation of parasitic worms, not sufficient to cause obvious symptoms of disease, might bring about an increased rate of growth.

Experiment No. 6.—This observation, carried out by K. D. Downham, concerned 20 healthy lambs, all born in March, and picked out from a well-managed flock that had been periodically dosed with copper sulphate and received frequent changes of pasture throughout the previous summer. The lambs were divided into two equal groups the members of one of which received a dose of 15 grammes of phenothiazine on December 6th.

A second weighing carried out three weeks later showed an average increase of 0·7 per head among the group of dosed lambs in excess of the increase among the controls.

Experiment No. 7.—Another collaborator, J. W. Ironside of the Midland Agricultural College, carried out a similar observation on ten healthy lambs, previously treated with copper sulphate and nicotine sulphate.

Results also showed a slight increase of weight in favour of the treated group which during four weeks gained an average of 10·4 lb. as compared with 9·8 lb. in the controls.

EXPERIMENTS WITH SMALL DOSES.—It was felt that the large size of the dose and the bulky nature of the drug threatened to be the most powerful factor operating against its general use in sheep and we, therefore, carried out a few trials to ascertain whether it might not be possible to secure adequate anthelmintic action with a much smaller dose. Results of the trials carried out on eight sheep are shown in Table VI and indicate that whereas doses of less than 3 grammes had no action, those of 3 grammes (0·08 grammes per kg. body weight) and over, produced a marked effect.*

Some further evidence of the minimum effective dosage is given in Table IX, which suggests that amounts as small as 1·5 grammes and 1·75 grammes had some effect.

DAILY DOSES OF PHENOTHIAZINE MIXED WITH THE FOOD.—Doses of 2 grammes, 5 grammes and 10 grammes were tried in three pairs of sheep, the phenothiazine being given in powder form mixed with the food. The results, which are given in Table VII, show considerable effect even for the 2 gramme doses, the 10 gramme dose, however, producing the result more rapidly.

The sheep receiving the 10 gramme doses did not eat their medicated food at all readily but those on the smallest dose took it well; and suffered no ill effect whatsoever; the two sheep receiving 10 grammes daily, however,

*It is possible that the dose of 1 gramme given to these sheep four days previously may have helped to bring about the observed result. This possibility also applies to the results obtained in the goats, which had also received small doses two or three days previously.

began to show signs of intoxication after the first week, dullness and inappetence being the principal symptoms, and on the thirteenth day one of them died, showing diarrhoeic symptoms for a few hours before hand.

TOLERANCE OF SHEEP.—Apart from the daily dosing of 10 grammes no evidence of the slightest toxic effect had been observed in any of the therapeutic treatments of sheep; in an endeavour to obtain some idea of the toxic dose, therefore, four lambs weighing between 86 and 89 lb. received 40 grammes, 80 grammes, 200 grammes and 400 grammes of phenothiazine respectively, but without any signs of intoxication being produced.

The absence of result from the top dose seemed so surprising that it was repeated in another lamb of the same weight, but again produced no ill effect whatever.

The lamb that died as a result of repeated daily doses refused food for the last day or two and showed a dark red diarrhoea before death;* this lamb was in a particularly poor condition when the treatment commenced, which may have had something to do with the fatal result; a second one in better condition, however, also showed signs of intoxication although it survived 16 daily doses of 10 grammes. Two other lambs which received daily doses of 5 grammes each showed no such symptoms.

SUMMARY OF OBSERVATIONS IN SHEEP.—Extensive trials suggest that in doses of 15 to 30 grammes (0.5 to 1 gramme per kg. body weight) phenothiazine has a remarkably good anthelmintic effect in sheep, the efficiency of its action ranging round 100 per cent for worms in the fourth stomach and 80 per cent for most of the worms in the small intestine. Where used in actual outbreaks of parasitic gastritis its effect is reflected in very considerable gain in weight.

Less extensive trials suggest that doses as low as 0.08 gramme per kg. body-weight have a considerable anthelmintic effect although the action of larger doses is more reliable.

The tolerance of sheep is extraordinarily high, 400 grammes having been given without ill-effect; a repeated daily dose of 10 grammes, however, produced a fatal intoxication in one instance.

* *Post-mortem* findings in this sheep were as follows:—

Nasal passages filled with a catarrhal exudate of a pink colour, presumably due to the inhalation of phenothiazine powder, the mucous membrane over the turbinated bones and in the upper part of the trachea was of a dark reddish brown colour, but apparently not inflamed, the coloration presumably also being due to the formation of thionol from the drug. Bronchioles also contained much catarrhal exudate. Liver showed signs of fatty degeneration: the kidneys were of a dark red colour, the pelvis containing a brownish liquid. The fourth stomach showed a slight inflammation of the mucous membrane throughout its whole extent.

Sheep will take 2 grammes to 5 grammes mixed with the food, a good anthelmintic effect being produced even by the smaller dose.

Administration is best carried out by means of 5 gramme tablets and a rubber-ended balling gun.* Given adequate assistance it is possible for one person using a balling gun to administer a 10-gramme dose to 160 lambs in an hour.

Goats

Experiment No. 8.—The following observations were made on the effects of phenothiazine on a group of goats at the Ministry's Laboratory, many of their number suffering severely from parasitic gastritis.†

Fifty-three goats were used for this experiment; 25 received one dose of phenothiazine in capsule form, varying between 10 grammes and 30 grammes according to the size of the goat, and 28 were kept as controls.

During the three weeks observational period the egg count among the 25 treated goats was reduced from an average of 5,080 to an average of 533, the egg count among the 28 controls falling from an average of 6,696 to 3,808 during the same period.

Several of the goats showed signs of intoxication for three or four days after the administration of these doses; they refused all food, looked dull, and were often seen to stand motionless in a corner of the stall with their heads hanging down.

As a result of the various origins of the experimental goats, and the small number of *post-mortem* examinations carried out, the results are less conclusive than they otherwise would have been, but they suggest that the drug acted particularly powerfully on *Ostretagia circumcincta* and on *Trichostrongylus axei*, less powerfully on worms in general in the small intestine and not at all on *Nematodirus filicollis*, *Moniezia* spp. and *Fasciola hepatica*.

The *post-mortem* results also suggest the 10 gramme dose to have been less efficient than the 20 and 30 gramme doses.

* In a private communication received since this was written, Dr. Robertson of the Aberdeen School of Agriculture claims to have dosed sheep with the liquid form of phenothiazine at the rate of four per minute. McEwen and Rowlands also preferred the liquid and as the tablets are very awkward to administer without the proper balling gun this form of the drug may be found to be the most generally useful.

† These goats had been collected from various centres in Wales, and in Ireland, several of them being in a more or less advanced stage of parasitism on arriving at the Laboratory. On account of their different origins, therefore, the nature of their helminthic infections did not conform so nearly to one type as it would have done had they all come from one source.

THE EFFECT OF SMALL DOSES IN GOATS.

Experiment No. 9.—In this experiment eight goats received gradually increasing doses of phenothiazine at intervals of four days, the doses ranging from 0.5 gramme to 12 grammes. The data which were collected are shown in Table II and indicate that doses up to $1\frac{1}{2}$ grammes are without effect; a dose of 4 grammes appears to have had some effect, 6 grammes had a decided effect, and the 8 gramme dose appears to have been just as effective as the 12 gramme dose given later. In one or two instances, however, the small doses failed to expel a considerable number of worms, notably in goat 428. These results conform with those of experiment 8 and it may be concluded that doses of less than 20 grammes, although effective, cannot be relied upon to produce the maximum anthelmintic action.

TOLERANCE OF GOATS.—In view of the signs of toxic action seen in several of the treated goats a series of trials was carried out in order to assess the toxic dose. In the first trial six goat kids were treated with 10, 20, 30, 40, 50 and 60 grammes respectively, of phenothiazine, but without producing any ill effect. Eight adult goats were next treated with 50, 60, 70, 80, 90, 100, 110 and 120 grammes respectively, but again without producing any ill effect.

Only three days later when it became clear that there was a negative result from the previous administration a dose of 400 grammes was given to the goat that had previously received 80 grammes, but even this produced no noticeable effect whatever.

SUMMARY OF RESULTS IN GOATS.—Our observations suggest that at certain times goats may be less tolerant of phenothiazine than are sheep, but even at those times are good subjects for anthelmintic treatment with this drug. At other times they are able to withstand enormous doses, similar to sheep. Doses varying between 10 and 30 grammes reduced the egg count to one-tenth of what it was before treatment was carried out. A dose of 6 grammes reduced the infestation very considerably and an 8 gramme dose appeared to be in no way inferior to a 12 gramme dose.

Cattle

Experiment No. 10.—Concerned an outbreak of parasitic gastritis among seven Jersey calves in which two had just died at the time that the outbreak came to our notice. Egg counts made on samples of faeces collected from two dead calves on September 3rd gave a count of 3,900 and 1,500 eggs per gramme respectively, counts that are considered to be high for cattle. *Post-mortem* examination showed the presence of a pure infestation of *Ostertagia ostertagi*, 8,200 being recovered from the fourth stomach of one calf and 20,200 from the other.

Three of the five remaining calves were then treated with 25, 35 and 45 grammes of phenothiazine powder respectively, and the other two kept as controls. On September 13th the three treated calves were found to have improved in condition and to have recovered from the diarrhoea; one of the two controls, however, looked distinctly worse than on the previous occasion and so was given a dose of 30 grammes of phenothiazine. This animal died on September 20th, presumably having been beyond the hope of recovery at the time that treatment was given: *Post-mortem* examination revealed the presence of only 200 *O. ostertagi* in the stomach and 600 in the small intestine. The remainder of the animals ultimately made a good recovery.

This observations appears to indicate the efficiency of 25 to 40 gramme doses of phenothiazine against *O. ostertagi* in calves.

Experiment No. 11.— Was carried out by W. J. Ironside of the Midland Agricultural College on six cattle which had previously received treatment with copper sulphate and nicotine sulphate.

The three treated cattle varied considerably in size but all received the same dose of 70 grammes of phenothiazine, as a result of which they were all very seriously upset and refused food for several days. One of the three, which was in a weak state at the time of dosing, became so ill that it was expected to die; but all ultimately made a good recovery.

The egg count per gramme of faeces in the treated cattle was reduced during the three weeks observational period from 800,100 and 1,200 to 200, 0, and 0, respectively, whereas among the three controls the successive counts were 30, 1,300 and 700, respectively, at the first examination, and 400, 1,000 and 900 at the second.

TOLERANCE OF CATTLE.—The suggestion of susceptibility to toxic action given in experiment 11 led to our carrying out one or two direct observations on this point, and on October 26th a dose of 1,000 grammes was given in the form of a drench to a 14-weeks-old calf, it being anticipated that the tolerance of cattle might approach that of sheep. Within an hour the calf lay down and would not rise; on the following day it was found to be lying on its side, the temperature having risen to 102.4° , at which point it remained. Great muscular weakness was noted on October 28th and 29th, on October 30th respiration was observed to be rapid; the pulse was weak, and death occurred during the afternoon.

Post-mortem examination showed extensive ulceration of the mucous membrane at the pyloric end of the stomach, and slight inflammation throughout the whole length of the bowel lining. The liver and lungs were

congested; the kidneys appeared to be normal. Petechial haemorrhages were seen under the pericardium. Some little time after exposure to air the whole carcase took on a red colour—due, presumably, to the oxidation of the thionol which is one of the products of phenothiazine in the animal body and is responsible for the red coloration of the urine. Portions of tissue taken for sectioning also produced a bright pink coloration in the fixative.

A second calf, 12 weeks old, and weighing about 150 lb., received a dose of 200 grammes on the same date, October 26th; on the 27th it was found to be lying down and refused food, during the following eight days it became increasingly weak and it died on November 5th.

At *post-mortem* examination ulceration of the abomasal mucous membrane was again seen, particularly at the pyloric end, the contents of the rumen were very fluid and there were signs of slight inflammation in the mucous membrane of the first, second and third stomachs. The intestines were also slightly inflamed. The liver was friable and yellowish in colour; the kidneys appeared to be enlarged but did not show pathological changes on microscopic examination.

A third calf, 5 months old but weak and very small, weighing only 105 lb., was dosed with 85 grammes of phenothiazine in the form of a drench. On the following morning it was found lying down, sweating and showing signs of great distress, the abdomen being distended. As it appeared to be no better in the afternoon it was destroyed. At *post mortem* examination the mucous membrane of the abomasum was found to be acutely inflamed, particularly at the pyloric end where ulceration had begun. Slight inflammation of the small intestine, extending into the caecum was also observed. The liver and kidneys were normal.

A fourth calf, also 5 months old, but well grown, weighing 273 lb., was treated with 100 grammes in liquid form but showed no untoward results whatsoever; it went on feeding and behaving in a perfectly normal way from the time that the dose was given.

SUMMARY OF OBSERVATIONS IN CATTLE.—Although two experiments Nos. 10 and 11—gave indications of good results similar to those obtained in sheep, observations on the tolerance of cattle show them to be sensitive to the toxic action of the drug and suggest that a dose of something like two grammes per kilo may prove fatal to a 3 to 5 months-old calf.

It seems probable that the drug will prove less useful in cattle than in other ruminants.

Horses

The remarkably good results obtained in the treatment of horses are recorded in Table VIII, *a*, *b* and *c*, and represent data which we have been able to collect since September 15th, 1939, when the first trial was carried out.*

The method of procedure has been to omit one or perhaps two feeds in order to increase the animal's appetite and then to offer the powdered drug mixed with a bran mash or with a little oats and treacle when, as a rule, the horse would take it voluntarily.

The method followed in carrying out the faecal examinations was as follows: First, an estimate of the number of eggs per gramme was made by applying the new McMaster technique,† then the faeces were cultured at 26°C. and in the eight days time the third-stage larvae separated by means of Baermann's apparatus; these were then differentiated into species and groups of species, and the original egg count divided proportionately.

These trials demonstrate a very remarkable efficiency for all of the strongyloid parasites of the large intestine, the adults at least, being completely eradicated as the result of the administration of a dose of between 30 and 60 grammes.

Trichostrongylus axei, presumably because of its different situation (in the stomach), is more resistant and in several instances appears to have been the only strongyloid parasite to withstand the treatment. *Ascaris* also responds to the treatment but *Anoplocephala*, data concerning which are not given in the table, did not.

TOLERANCE OF HORSES.—Horses appear to be very good subjects for treatment with phenothiazine, the large number of trials, data from which are set down in Table VIII, *a*, *b* and *c*, having been carried out without any definite symptoms of intoxication although in several instances slight inappetence was observed about 24 hours after treatment.

* The trials in horses have been carried out with the kind co-operation of the following veterinarians and people associated with thorough bred studs: J. R. Barker, J. Bell, J. W. Bruford, F. J. Carless, P. Crossfield, K. D. Downham, C. C. Edmunds, J. Macarthur and E. B. Reynolds.

† The McMaster egg counting technique has been found, in our hands, to be as accurate as the dilution method previously in use at this Laboratory, and is a quicker and more convenient way of working. We have introduced one slight improvement in that the 3 gramme sample of faeces is first mixed with water, centrifugalised and the supernatant cloudy liquid discarded before a 66 per cent saturated salt solution is added and the count made in the special cell described by Gordon and Whitlock (1939). This preliminary washing not only allows a greater amount of light to make its way through the preparation but permits of the enumeration of the eggs of *Ascaris*, *Trichuris* and *Fasciola* and of lungworm larvae. These do not float to the top of the two-thirds saturated salt solution that is found to be the most useful medium for the enumeration of strongyloid eggs.

SUMMARY OF OBSERVATIONS IN HORSES.—Phenothiazine at a dose rate of 0.16 gramme to 0.08 gramme per kg. body weight (30 grammes to 40 grammes for a hunter) is 100 per cent. efficient against red-worms. A dose of 20 grammes is also effective but less reliable, but a dose of 10 grammes produces no anthelmintic effect. *Trichostrongylus axei* does not respond well nor do *Anoplocephala* spp. but *Ascaris* is, as a rule, satisfactorily expelled.

Horses appear to tolerate this drug very well indeed, no clear instance of intoxication having been observed.

EFFECT OF PHENOTHIAZINE ON EGGS AND ON THE DEVELOPMENT OF INFECTIVE LARVAE IN THE FAECES.

Examination of faeces from a calf which had received 45 grammes of phenothiazine on the previous day showed all of the eggs (some 1,100 per gramme) to be dead; the contents being opaque and shapeless and showing signs of degeneration.

Observations subsequently made on goats receiving small doses of phenothiazine showed that amounts too small to have any effect upon the adult worms were nevertheless sufficient to prevent the development of the larvae. The smallest dose employed was 0.25 gramme and as a goat passes something like 1,000 grammes of faeces during a day and the excretion of the phenothiazine in the faeces would be spread over three days it is obvious that the amount requisite for the prevention of larval development must be something quite small, presumably in the region of one part of phenothiazine in 8,000 of faeces.

The data from which this conclusion has been drawn are set down in Table IX.

Trials later carried out *in vitro* showed that a mixture of 1 : 100 or of 1 : 1,000 of phenothiazine powder in the faeces culture prevented the development of the larvae in a similar way. It was interesting to note, however, in an experiment in which the four treated goats were carrying a particularly heavy infection of *Mellerius*, that no effect whatsoever was produced on the larvae of this genus of lung-worms, living larvae being recovered from the culture in thousands.

An observation was next made to ascertain at what stage of larval development the action of the drug is most marked. Six 50-gramme cultures were made up for this purpose, half a gramme of phenothiazine being added to each at various stages during the culture period. When larvae were ultimately separated by means of Baermann's apparatus on the eighth day it was found that the drug had exerted its greatest influence on the eggs and early stages of development of the larvae. After the fifth day of development, *i. e.*, when the larvae had reached the infective stage, the

drug had taken comparatively little action. Particulars of this observation are shown in Table X.

Action in Vitro.—Solutions of phenothiazine of various strengths were prepared in physiological saline, between 20 and 30 *Trichostrongylus* worms, freshly collected at *post-mortem* examination, being placed in each solution and kept at 37°C.

The results show that within 18 hours the saturated and half saturated solutions had begun to take effect although all of the test worms were not killed until they had been in these solutions for 66 hours. The quarter-saturated solution also appeared to take some effect but test worms in the eighth-saturated solutions, behaved in the same way as the controls in physiological saline.

As phenothiazine is described by chemists as "practically insoluble" this result would suggest a very potent anthelmintic action on the part of the very small amount of substance in solution.*

Phenothiazine as an Anthelmintic

DISCUSSION — MENTIONING DATA REPORTED IN OTHER CONTRIBUTIONS TO THE SYMPOSIUM †

GENERAL ANTHELMINTIC ACTION.

The extensive observations which are here reported on the anthelmintic action of phenothiazine in farm animals provide ample evidence of the great importance of the discovery of this parasiticide in the annals of helminth control by the use of drugs.

In common with other anthelmintics its mode of action remains something of a mystery, and its addition to the short list of really effective medicinal parasiticides cannot be regarded as the outcome of a scientific understanding of the principles by which their action is governed. The use of phenothiazine as an anthelmintic can be traced back through a series of rational trials to the first observation on its insecticidal properties, made by the workers in the United States Bureau of Chemistry and Soils, who on account of the lack of information at present available on the correlations between chemical structure and parasiticide action were forced to carry out their investigations by a method of trial and error. As each new anthelmintic substance is found, however, fresh opportunity for study is

* A. Eden of this Laboratory has determined the solubility for us as being not greater than one in 50,000.

† "We" in this discussion refers to Taylor and Sanderson. Wherever reference is made to the work of other contributors to the symposium the name is given.

provided, and it is not improbable that an investigation of some of the peculiar points concerning phenothiazine treatment may help to explain the mode of anthelmintic action.

The most outstanding peculiarity concerns the requirement for a large dose of the drug. Although it is practically insoluble in water we were able to demonstrate a definite parasitocidal action on adult worms *in vitro*, and a very marked toxic action on the eggs and preinfective larval stages of stronglyloid worms in faeces, operating down to a dilution of about one part of the drug in 8,000 parts of faeces. (It was interesting to note, however, that *Muellerius* larvae were quite unaffected). Knipling (1938) obtained similar results in his observations on the control of the hornfly in cattle when he found that the phenothiazine passing through the intestine of cattle for three days after dosing was sufficient to inhibit the development of hornfly larvae in the faeces.

These observations are suggestive of an extremely potent action of this drug since the actual amount in solution must be very small indeed, and it is surprising to find that rather large doses are requisite for full anthelmintic action. Swales (1939) considered it necessary to give 20 or 30 grammes to a sheep and Swanson *et al.* (1940) gave up to 30 grammes to a pig. Although our observations indicate the adequacy of a smaller dose it is nevertheless much greater than the tests *in vitro* would seem to indicate. Our results suggest that a dose of 5 grammes produces a good anthelmintic effect in sheep, and that 10 grammes approaches to the maximum anthelmintic affect. Ten grammes to a horse was clearly inadequate but 20 grammes, in some instances, proved to be 100 per cent efficient, although in others its action was much less marked; 20 grammes however produced the maximum result in almost every instance and it may be concluded from our results that for ordinary purposes, 10 grammes (0.3 grammes per kilo) is adequate for a sheep and 30 grammes (0.06 grammes per kilo) for a horse.

An interesting observation in connection with dosage was made at the Zoological Gardens, London, by G. M. Vevers who, in a private communication, reported the expulsion of large numbers of *Enterobius* from a gorilla as the result of the administration of only 0.5 grammes of phenothiazine.

There is, therefore, seen to be something unusual about the anthelmintic action of this drug in that the dose generally required, having regard to the insolubility of the drug, seems to be unnecessarily large. In an endeavour to explain this peculiarity we considered the possibility of the formation within the animal body, of some second substance, of much greater anthelmintic potency than that of phenothiazine, and for this purpose we administered 30 grammes to one goat, collected the faeces on the second day afterwards and administered 30 grammes of the phenothiazine-containing faeces

to a second goat heavily infected with parasitic worms. A filtrate of a watery solution of another 30 grammes of the same faeces was administered to a third goat, also heavily infected with parasitic worms. Observations on the egg output of the two goats that received the "medicated" faeces failed, however, to reveal any effect on the parasitic worms.

Following this observation we carried out two trials with oxidation products of phenothiazine produced within the animal body. The first of these was thionol* which is the red dye that causes the red coloration of the urine in animals treated with phenothiazine and is the oxidation product of leucothionol which, after exposure of small portions of tissue to the air, is seen to be present in almost every part of the body of an animal that has received the large dose of phenothiazine. These substances form the reversible oxidation-reduction system thionol—leucothionol, similar to that of methylene blue—leucomethylene blue, well known to workers on clean milk. The second substance was phenothiazone which according to Gersdorff and Claborn (1938) is extremely toxic to goldfish.

Both of these substances were tested in doses of 0.25 grammes and 2 grammes in goats heavily infected with parasitic worms but without producing any anthelmintic effect whatsoever.

Nothing, therefore, was done to elucidate the reason for the necessity of giving much more phenothiazine than is required to produce a saturated solution in the contents of the intestinal tract in order to produce anthelmintic action,† but it seems not unlikely that some factor of importance for the understanding of the action of phenothiazine, and, possibly for the understanding of anthelmintic action in general, lies hidden in this one particular problem.

SPECIFICITY OF ANTHELMINTIC ACTION.

Our own results show that phenothiazine is particularly lethal to strongyloid worms § its most pronounced and certain action being exerted on those in the large intestine of the horse, where, in adequate dosage, it can

* The thionol and phenothiazone was kindly prepared for our use by Dr. Sexton of the Imperial Chemical Industries Laboratories at Blackley.

† The theory on which we are working at the present time is that it is necessary to maintain a saturated or nearly saturated solution of phenothiazine in the intestine for some considerable time in order to secure anthelmintic action and that to insure against the exhaustion of the reservoir of phenothiazine in the rumen, or in the large intestine in equines) it is necessary to give a large dose. *In vitro* observations appear to support his view.

§ An interesting exception has been mentioned by Manson-Bahr, who, in a private communication, reported having found phenothiazine to be relatively infective against *Ancylostoma* although very effective against some other worms in the human being.

TABLE I (Experiment No. 1)
Worms recovered at post-mortem examination from six lambs dosed with 15 grammes of Sualos phenothiazine mixture, and from five undosed controls

No. of Lambs	Stomach.						Small Intestine.						Eggs per Gramme Faeces.	
													Before Dosing.	5 Days After Dosing.
	Total.	<i>O. circumcincta.</i>	<i>O. trifurcata.</i>	<i>T. axei.</i>	<i>H. contortus.</i>	Larvae.	Total.	<i>T. vitrinus.</i>	<i>T. colubriformis.</i>	<i>C. curvica.</i>	<i>C. oncophora.</i>	<i>N. filicollis.</i>	Larvae.	Moniezia.
92	55,400	25,853	5,540	9,233	—	14,774	48,318	40,250	1,610	—	—	—	6,440	18
83	26,300	18,410	2,630	5,260	—	—	51,412	30,840	2,570	2,570	2,570	12,550	—	12
84	15,100	11,325	1,510	2,265	—	—	15,500	6,200	3,875	—	—	4,650	775	—
85	19,200	7,642	4,775	6,685	100	—	44,104	39,690	—	2,305	—	—	—	4
90	2,100	2,100	—	—	—	—	13,002	9,750	1,300	650	—	1,300	—	2
Average	23,620	1,3066	2,891	4,689	20	2,955	34,467	25,346	1,871	1,081	514	3,700	241	7
88	—	—	—	—	—	—	1,004	400	—	—	—	—	600	4
91	—	—	—	—	—	—	5,702	—	5,130	—	—	—	—	2
89	—	—	—	—	—	—	9,407	2,350	—	470	—	6,500	—	7
82	—	—	—	—	—	—	19,813	12,870	1,980	990	—	2,970	—	13
87	—	—	—	—	—	—	3,004	2,100	600	—	—	300	—	4
86	—	—	—	—	—	—	1,600	960	640	—	—	—	—	—
Average	—	—	—	—	—	—	6,755	3,113	1,391	243	260	1,628	100	5
Indicated efficiency per cent.	100	100	100	100	100	100	80.4	87.7	25.6	77.7	49.4	56.0	58.0	

Control Lambs.

TABLE II (Experiment No. 9)
Showing the effect of small doses of phenothiazine in goats

Grammes of Phenothiazine Given		Eggs per Gramme of Faeces.										Worms Found in Stomach					Worms Found in Small Intestine		Worms Found in Large Intestine.			Eggs per Gramme in Faeces.				
No. of Goat.		10-4.40.	17-4.40.	22-4.40.	26-4.40.	27-3.40.	11-4.40.	12-4.40.	15-4.40.	17-4.40.	22-4.40.	26-4.40.	30-4.40.	4-3.40.	7-3.40.	<i>H. contortus.</i>	<i>O. circumcincta.</i>	<i>O. trifurcata.</i>	<i>T. axei.</i>	<i>T. vitrinus.</i>	<i>T. colubriformis.</i>		<i>N. filicollis.</i>	<i>T. ovis.</i>	<i>O. venulosum.</i>	<i>S. ovis.</i>
396	1	2	4	4	6	3,800	7,500	7,100	8,200	5,500	7,000	1,100	1,900	2,500	1,400	1	200	200	1,400	2,700	2,340	360	1	24	30	1,400
397	2	4	4	6	6	1,100	1,300	300	600	700	1,400	600	200	500	200	1	—	—	200	1,200	1,200	—	1	8	—	200
425	2	4	4	6	2,100	3,400	1,500	1,600	2,500	2,300	2,600	3,600	2,000	1,400	1,300	—	400	400	300	4,000	800	—	7	20	—	1,300
430	2	4	4	6	1,200	3,400	3,500	2,200	2,200	5,700	9,600	1,500	600	200	100	—	100	—	100	500	200	200	10	—	—	100
386	1	1	8	12	300	100	200	200	300	600	100	0	0	0	0	—	—	—	—	—	—	—	22	2	—	—
418	1	1	8	12	4,400	4,500	5,700	6,900	1,600	1,600	1,700	100	100	100	0	—	100	—	—	400	—	—	—	—	—	—
428	1	1	8	12	2,400	4,600	8,000	9,400	7,000	2,400	2,400	2,100	3,300	4,300	4,200	100	3,173	—	20,627	11,873	1,827	—	15	—	2	6,200
436	1	1	8	12	2,000	2,300	1,300	3,800	2,500	3,300	3,300	800	700	600	500	900	2,000	—	2,700	1,200	1,500	—	48	185	308	541

TABLE III (Experiment No. 2)

Showing the effect of a 15 gramme dose of phenothiazine administered at the end of an outbreak of parasitic gastritis to a group of 20 lambs many of which had been severely affected.

Dates of Dosings and Weighings.	20 Lambs dosed with Phenothiazine			20 Control Lambs.		
	Average Weight in lb.	Average Increase in Weight.	Egg Count per gramme.	Average Weight in lb.	Average Increase in Weight.	Egg Count per gramme.
13-9-39	61.1		2,400	61.1		2,300
22-9-39	64.2	3.1		63.4	2.3	
29-9-39	65.4	1.2	500	64.4	1.0	1,400
13-10-39	70.8	5.4		68.6	4.2	

For particulars of worm infestation see Table I, the lambs referred to in Tables I and II belonging to the same flock.

Increase in favour of dosed sheep = 2.2 lb. per head in one month.

TABLE IV (Experiment No. 3)

Showing the effect of a 20 gramme dose of phenothiazine administered towards the end of an outbreak of parasitic gastritis to a group of 28 lambs many of which had been severely affected. Species of Ostertagia were principally concerned in this outbreak

Dates of Dosings and Weighings.	28 Lambs dosed with Phenothiazine.			28 Control Lambs.		
	Average Weight in lb.	Average Increase in Weight.	Egg Count per gramme.	Average Weight in lb.	Average Increase in Weight.	Egg Count per gramme.
30-9-39	61.3		5,100	63.4		5,100
21-10-39	74.0	12.7	200	67.5	4.1	2,400
14-11-39	78.3	4.3	200	68.4	0.9	1,400

Increase in favour of dosed sheep in six weeks = 12 lb. per head, or a total of 336 lb.

TABLE V (Experiment No. 4)

Showing the effect of a 30 gramme dose of phenothiazine administered to lambs two months after the termination of an outbreak of parasitic gastritis, resulting principally from an Ostertagia infestation

Dates of Dosing and Weighing.	10 Lambs dosed with 30 grammes Phenothiazine.			20 Control Lambs		
	Average Weight in lb.	Average Increase in Weight	Egg Count per gramme.	Average Weight in lb.	Average Increase in Weight.	Egg Count per gramme.
31-10-39	78.0		4,500	84.1		4,500
23-11-39	80.3	2.3	200	84.3	0.2	5,300

Increase in favour of dosed lambs = 2.1 lb. per head in three weeks.

TABLE VI

Showing the effect of small doses of phenothiazine on a mixed infection, principally, Haemonchus contortus, in sheep

No. of Sheep	Grammes of Phenothiazine given.				Eggs per gramme of Faeces.							
	19.4.40	23.4.40	27.4.40	1.5.40	12.1.40	20.1.40	23.1.40	27.1.40	1.5.40	6.5.40	10.5.40	15.5.40
1	$\frac{1}{4}$	1	3	5	12,000	16,900	22,900	2,000	800	300	400	300
2	$\frac{1}{4}$	1	3	5	2,600	5,900	4,900	6,300	700	100	700	700
3	$\frac{1}{4}$	1	3	5	800	2,900	2,500	2,800	300	200	400	400
4	$\frac{1}{4}$	1	3	5	500	300	1,300	800	800	1,200	700	400
5	$\frac{1}{2}$	2	4	6	7,600	3,900	5,700	7,700	700	100	300	1,000
6	$\frac{1}{2}$	2	4	6	2,200	2,400	7,200	1,600	500	600	500	300
7	$\frac{1}{2}$	2	4	6	1,000	4,100	3,900	2,100	500	100	200	800
8	$\frac{1}{2}$	2	4	6	800	1,500	3,500	1,500	600	200	700	400

TABLE VII

Showing the effect of the repeated administration of small doses of phenothiazine to sheep

Date.	Eggs per Gramme of Faeces in Six Experimental Sheep.					
	2 Gramme Doses of Phenothiazine Daily.		5 Gramme Doses of Phenothiazine Daily.		10 Gramme Doses of Phenothiazine Daily.	
	Sheep 1.	Sheep 2.	Sheep 3.	Sheep 4.	Sheep 5.	Sheep 6.
26-1-40	2,800	700	600	900	7,700	2,100
2-2-40	2,800	200	2,600	100	7,400	500
3-2-40	400	200	1,400	—	2,300	200
5-2-40	300	100	200	—	400	—
6-2-40	100	—	100	—	100	—
7-2-40	100	400	200	—	—	—
8-2-40	100	200	100	—	—	100
9-2-40	100	—	500	—	—	200
10-2-40	—	—	200	—	—	—
12-2-40	700	—	—	—	—	—
13-2-40	100	100	100	—	—	—
14-2-40	200	—	—	—	—	—
15-2-40	400	100	—	—	—	Died
16-2-40	—	—	—	—	—	
17-2-40	—	100	—	—	—	
19-2-40	—	100	—	—	—	
20-2-40	100	100	—	—	—	
21-2-40	—	—	—	—	—	
22-2-40	100	—	—	—	—	
23-2-40	—	—	—	—	—	
24-2-40	—	—	—	—	—	
25-2-40	—	—	—	—	—	
26-2-40	—	—	—	—	—	
27-2-40	—	200	—	—	—	
28-2-40	—	100	—	—	—	
29-2-40	100	100	—	—	—	

TABLE VIIIA

Showing the effect of doses of phenothiazine ranging from 10 grammes to 25 grammes on strongyloid worms in horses

Particulars of Horse.	Dose of Phenothiazine in Grammes.	Egg Count Before Treatment.						Egg Count 2 to 4 Weeks After Treatment.					
		<i>Ascaris</i> .	<i>Trichonema, etc.</i>	<i>S. edentatus</i> .	<i>S. equinus</i> .	<i>S. vulgaris</i> .	<i>T. axei</i> .	<i>Ascaris</i> .	<i>Trichonema, etc.</i>	<i>S. edentatus</i> .	<i>S. equinus</i> .	<i>S. vulgaris</i> .	<i>T. axei</i> .
	10	—	350	115	5	30	0	0	864	216	0	120	0
	„	—	790	140	20	50	0	0	1,411	136	0	154	0
	„	—	98	80	40	18	0	0	178	12	10	0	0
6-year-old Hunter	„	—	616	341	0	66	77	0	1,064	84	0	28	224
4-year-old „	„	—	803	275	0	11	11	0	1,920	336	0	144	0
11-year old „	„	—	304	0	0	68	28	0	882	0	0	9	9
5-year-old „	„	—	97	1	0	0	2	0	837	9	0	54	0
9-year-old „	„	—	69	12	0	16	3	0	1,425	0	0	75	0
10-year-old Thoroughbred	„	—	1,392	0	0	208	0	0	255	12	0	21	12
8-year-old „	15	—	336	24	0	240	0	0	648	40	0	112	0
3-year-old „	„	—	372	108	12	696	12	0	40	3	0	57	0
1-year-old „	„	—	528	0	0	624	48	0	0	0	0	24	0
2-year-old „	„	—	462	14	0	224	0	0	0	0	0	+	0
	20	—	600	0	0	0	0	0	1	0	0	0	0
	„	—	400	0	0	0	0	0	100	0	0	0	0
1-year-old „	„	—	679	14	0	7	0	0	+	0	0	0	+
Yearling Hunter	„	500	3,485	123	0	492	0	0	0	0	0	1	0
	„	—	1,170	18	0	612	0	0	8	6	0	186	0
3-year-old „	25	—	1,216	32	0	352	0	0	0	80	0	320	0
3-year-old „	„	—	480	450	0	570	0	0	20	40	0	340	0

— = less than 100 per gramme. + = less than 1 per gramme. 0 = absent.

TABLE VIIIb

Showing the effect of a dose of 30 grammes of phenothiazine on strongyloid worms in horses

Particulars of Horse.	Dose of Phenothiazine in Grammes.	Egg Count Before Treatment.						Egg Count 2 to 4 Weeks After Treatment					
		<i>Ascaris.</i>	<i>Trichonema, etc.</i>	<i>S. edentatus.</i>	<i>S. equinus.</i>	<i>S. vulgaris.</i>	<i>T. axei.</i>	<i>Ascaris.</i>	<i>Trichonema, etc.</i>	<i>S. edentatus.</i>	<i>S. equinus.</i>	<i>S. vulgaris.</i>	<i>T. axei.</i>
Thoroughbred Foal	30	200	400	400	0	0	0	0	0	0	0	0	8
"	"	500	300	300	0	0	0	0	0	0	0	0	33
"	"	—	1,600	0	0	0	0	0	11	3	0	0	1
4-year-old Thoroughbred	"	—	252	24	0	0	24	0	3	0	0	0	3
2-year-old	"	—	495	0	0	5	0	0	0	0	0	+	+
2-year-old "	"	—	384	12	0	4	0	0	+	0	0	+	0
Yearling	"	100	640	0	0	144	16	2	0	0	0	0	0
Thoroughbred	"	—	720	32	0	48	0	0	0	0	0	0	8
"	"	200	1,581	85	0	34	0	300	0	0	0	0	0
"	"	300	990	33	0	77	0	0	0	0	0	0	0
"	"	—	344	28	0	28	0	0	0	0	0	0	0
"	"	—	156	87	0	36	21	0	0	0	0	0	1
"	"	—	920	0	0	70	10	0	0	0	0	0	2
"	"	—	640	0	0	160	0	0	0	0	0	0	2
"	"	—	700	0	0	0	0	0	0	0	0	0	0
"	"	—	192	4	0	2	2	0	0	0	0	0	5

— = less than 100 per gramme. + = less than 1 per gramme. 0 = absent.

TABLE VIIIc

Showing the effect of doses of 50 and 60 grammes of phenothiazine on strongyloid worms in horses

Particulars of Horse.	Dose of Phenothiazine in Grammes.	Egg Count Before Treatment						Egg Count 2 to 4 Weeks After Treatment.					
		<i>Ascaris.</i>	<i>Trichonema, etc.</i>	<i>S. edentatus.</i>	<i>S. equinus.</i>	<i>S. vulgaris.</i>	<i>T. axei.</i>	<i>Ascaris.</i>	<i>Trichonema, etc.</i>	<i>S. edentatus.</i>	<i>S. equinus.</i>	<i>S. vulgaris.</i>	<i>T. axei.</i>
4-year-old Thoroughbred .	50	—	500	0	0	0	0	0	+	0	0	+	0
"	"	—	1,598	34	0	68	0	0	0	0	0	4	0
7-year-old .	60	—	500	0	0	0	0	0	1	0	0	0	0
"	"	—	800	0	0	0	0	0	0	0	0	0	0
Cart colt .	"	...	546	112	0	21	21	0	0	1	0	0	6
Thoroughbred barren mare .	"	—	95	2	0	0	3	0	0	0	0	0	0
"	"	—	700	0	0	0	0	0	0	0	0	0	0
"	"	—	68	0	0	0	0	0	0	0	0	0	0
"	"	—	465	35	0	0	0	0	0	0	0	0	0
"	"	—	776	8	0	0	16	0	0	0	0	0	200
6-year-old Thoroughbred	"	—	1,064	84	0	28	0	0	0	0	0	0	7
4-year-old "	"	—	1,920	336	0	144	0	0	0	0	0	0	8
11-year-old "	"	...	882	0	0	9	0	0	0	0	0	0	0
5-year-old "	"	—	837	9	0	54	0	0	0	6	0	0	0
9-year-old "	"	...	1,425	0	0	75	0	0	0	1	0	5	0
Thoroughbred .	"	...	980	0	0	20	0	0	0	0	0	0	2
"	"	...	990	0	0	10	0	0	0	0	0	0	0
"	"	...	207	48	3	39	3	0	0	0	0	0	2
Debilitated hunter	"	...	1,092	60	0	48	0	0	0	0	0	0	0
"	"	...	972	228	0	0	0	0	+	0	0	0	0
"	"	...	1,805	95	0	0	0	0	0	0	0	0	0
"	"	...	658	42	0	0	0	0	0	0	0	0	+
"	"	...	282	12	0	0	6	0	0	0	0	0	4
"	"	...	178	14	0	0	0	0	0	0	0	0	0

— = less than 100 per gramme. + = less than 1 per gramme. 0 = absent.

TABLE IX

Showing the effect of small doses of phenothiazine in preventing the development of third-stage larvae in the faeces of goats

Date.	Dose of Phenothiazine in Grammes.	Goat 388.		Goat 389.		Goat 414.	
		Eggs per Gramme of Faeces.	Larvae per Gramme of Faeces.	Eggs per Gramme of Faeces.	Larvae per Gramme of Faeces.	Eggs per Gramme of Faeces.	Larvae per Gramme of Faeces.
7-3-40	0.25						
8-3-40		1,500	0	200	0	500	0
9-3-40		2,400	11	300	0	600	25
11-3-40	0.75	2,600	54	300	9	400	81
12-3-40		1,300	0	0	0	300	0
13-3-40	1.0	2,800	2	400	6	900	96
14-3-40		1,400	0	500	0	300	0
15-3-40	1.25	1,200	7	200	0	300	0
16-3-40		1,000	0	500	0	400	0
18-3-40	1.5	1,700	34	500	19	400	87
19-3-40		700	0	200	0	100	0
20-3-40	1.75	1,100	0	200	0	300	0
21-3-40		500	0	400	0	500	
25-3-40		500	2	400	0	200	0
26-3-40		500	86	200	130	300	144
27-3-40		600	51	100	19	400	140
28-3-40		700	170	300	112	700	92
1-4-40		800	124	400	132	600	204

TABLE X

Showing the effect on the development of larvae of a mixture of 1 per cent. of phenothiazine in the faeces added at various stages during the culture period

Date when 1 per cent. Phenothiazine was Mixed with Cultures made 15-12-39.	Number of Trichostrongyloid Larvae. Recovered 23-12-39.	Date when 1 per cent. Phenothiazine was Mixed with Cultures made 15-12-39.	Number of Trichostrongyloid Larvae. Recovered 23-12-39.
15-12-39	0	19-12-39	30,640
16-12-39	2	20-12-39	53,200
18-12-39	5,680	Control	88,000

be relied upon to eradicate all of the adult forms. The species of *Strongylus*, however, appear to be slightly more resistant than are the smaller "red-worms", *S. Vulgaris* being the most resistant of all.

Second only in efficiency is its action on the tricho-strongylid worms in the fourth stomach of sheep where, in adequate dosage, it has proved to be 100 per cent. efficient on several occasions; this high efficiency is, however, less reliable, than on the red-worms in horses. Species of *Ostertagia* respond particularly well, *Haemonchus* appears to be less sensitive and *Trichostrongylus* and *Cooperia* occupy an intermediate position in this respect.

One interesting point which came to our notice was the very good action of the drug on *Trichostrongylus axei* in the fourth stomach of sheep—100 per cent. frequently being removed—and its comparative lack of action on the same species when present in the stomach of the horse.

The action of the drug on worms in the small intestine of sheep is less pronounced than on those in the fourth stomach but is, nevertheless, better than that of any previously known anthelmintic. Apart from *Moniezia*, on which there is no action, *Nematodirus* appears to be the most resistant, but other species of trichostrongylid parasites in the small intestines may be regarded as giving a satisfactory response.

The results clearly show that there is no action upon *Fasciola*, nor upon *Anoplocephala*.

Action on ascarids is interesting in that it appears to be very good in the horse, moderately good in the pig and almost completely lacking in the dog, as shown by Montgomerie's results. This comparative response of ascarids to phenothiazine in these three kinds of hosts differs from their response to carbon tetrachloride as reported by Hall who found this drug to be more efficient against *Toxocara* and *Toxascaris* in the dog than against *Ascaris* in the horse.

ANTHELMINTIC EFFECT ON THE HOST.

The beneficial effect of treatment with phenothiazine has been very clearly demonstrated in some of the weighing experiments in which great gains have been observed as a result of the anthelmintic action of the drug. The most striking is described in *Experiment 3* in which one 20 gramme dose to each of a group of lambs resulted in the production of 336 lb. of mutton.

Observations carried out by McEwen and Taylor (to be reported later) and by McEwen alone on the Romney Marshes show significant gains in phenothiazine-treated sheep, over and above gains made by similar sheep

treated with a mixture of nicotine sulphate and copper sulphate. A difference of 9 lb. per head among a group of 27 lambs was noted in one instance.

The results obtained by J. W. Ironside and K. D. Downham (reported in this paper) in lightly infected flocks are also interesting, showing a slight gain in favour of the treated groups. The trials were, however, not sufficiently extensive to establish this point and the result obtained by S. J. Menzies (also reported here) in comparing phenothiazine with copper sulphate suggests that the effect of copper sulphate may be equally good in instances of slight infestation. On account of the inadequacy of data, however, this point cannot be regarded as certain.

Very good results have been observed wherever it has been tried in horses.

The effect in goats and in cattle has also been very good, apart from the toxic action that has been observed in some instances.

TOLERANCE AND TOXIC ACTION.

Domestic animals in general appear to be extraordinarily tolerant to this drug and there is usually found to be an enormous difference between the anthelmintic dose and the toxic dose. Two sheep and one goat were actually dosed with 80 times an effective anthelmintic dose without any signs of intoxication being produced. Horses appear to be only slightly less tolerant. Lapage, as reported in this symposium, having given as much as 500 grammes without producing marked symptoms, and a repeat dose of the same amount without causing a fatal intoxication; further data given by him, however, strongly suggest that 1,000 grammes produced a fatal result, although lesions found on *post-mortem* examination suggested that other pathological conditions may have been involved in the cause of death. Cattle, on the other hand, appear to be more sensitive to the toxic action of phenothiazine, 85 grammes having produced a fatal intoxication in a 105 lb. calf. The observations that we have been able to make concerning the use of the drug in cattle are few, but even in these animals the difference between the anthelmintic and the toxic dose appears to be considerably greater than it is with most, if not all other efficient anthelmintics.

Our observations have, however, revealed evidence of individual idiosyncrasy, or possibly of some special susceptibility associated with diet, so that we cannot yet write with certainty on the general safety of the larger doses. Our experience with goats provides an example of this point in that doses of 20 grammes and 30 grammes produced decided symptoms

of intoxication at one time (shortly after the arrival of the animals at the Laboratory) and at a later date amounts as great as 400 grammes failed to produce any signs of even the slightest indisposition.

Some evidence of this occasional intoxication has also been seen in horses, slight constitutional disturbance having been shown on a few occasions, in the form of dullness and inappetence lasting for about 24 hours after the administration of the dose.

Observations made to determine the toxic dose in rabbits showed that a single dose of 6 grammes causes more or less marked constitutional disturbance and that 10 grammes is fatal, representing a toxic dose of 4 grammes per kilo.

The effect of repeated daily doses proved to be more marked; one rabbit died after only four consecutive daily doses of 2 grammes, another after seven daily doses of 5 grammes, a third after 17 daily doses of 1 gramme and a fourth was still surviving and showed little sign of intoxication after 28 daily doses of 0.5 grammes. The toxic repeated daily dose is therefore seen to lie somewhere between 0.05 and 0.1 gramme per kilo.

The principal lesion seen on *post-mortem* examination was that of acute gastritis, the condition being less acute, and progressing to ulceration confined to the pyloric end of the stomach, in the lower doses. In one or two instances, the small intestine was slightly inflamed, the liver sometimes showed signs of fatty degeneration and the kidneys were sometimes pale in colour and enlarged.*

Further evidence of the greater toxicity of the repeated small doses over one large one was also obtained in *Experiment No. 8* in which daily doses of only 10 grammes killed one sheep and caused a relatively severe constitutional disturbance in a second one. A similar result was obtained by Lapage (reported elsewhere in this symposium) who found repeated doses of comparatively small amounts of phenothiazine to be markedly toxic for pigs. Manson-Bahr, in a private communication to us, has reported that no toxic symptoms were noted in a human patient after a thrice-repeated daily dose of 8 grammes of anthelmintic effect of which was very satisfactory.†

ADMINISTRATION AND DOSAGE.

One great advantage of this drug is its comparative tastelessness, so that animals will take it voluntarily, mixed with the food, a point which is of

* We have not yet had the opportunity of examining this and other material microscopically. Eddy *et al.* (1937), however, failed to find any injury to tissue after 295 consecutive daily doses to rats although the rats became stunted if the dose was sufficiently high.

† Manson-Bahr gave single doses of 30-40 grammes without ill effect except in one instance, when the 40-gramme dose produced sickness,

particular importance in the treatment of the horse and is likely to add considerably to the extent to which phenothiazine will be generally employed. Although the suspicions of a well-fed animal, on being presented with a medicated feed, may be aroused to such an extent that he will refuse it, a fast of a few hours' duration usually overcomes the disinclination and the feed, which should be made as tempting as possible, is taken without further difficulty.

This method may also be employed in pigs, although Lapage points out elsewhere in this symposium that by mixing the drug with the pigs' food certain members of a group, which are more hungry, or less sensitive to the slight taste of phenothiazine, may get much more than the calculated dose and their companions much less. The method may also be used in the treatment of sheep, and the occasional medication of dry feed in this way is one of the possibilities for carrying out periodic dosing that is worthy of serious consideration. The results of *experiment No. 8* suggests that a dose of 2 grammes may be adequate for this purpose, although 5 grammes is better.

During the early part of our work it was feared that the bulky nature of phenothiazine, and the large size of the dose that was thought to be necessary would have a serious reaction on its general usefulness in sheep. In co-operation with Imperial Chemical Industries, however, two preparations have been made, a suspension containing about 40 per cent. by weight of phenothiazine, and a tablet, containing 5 grammes of phenothiazine along with a little excipient and a substance that brings about the rapid disintegration of the mass when placed in water, these have proved very good indeed.

Every opportunity has been taken to have the two methods of administration (in liquid and in tablet form) tried out by various people who have been using the drug in sheep, and opinion on their relative merits has been almost equally divided. The tablets are given by means of a rubber-ended balling gun and in our experience are to be preferred over the administration of a liquid where the dose to be administered is not a large one. On one occasion we were able to give a dose of 10 grammes (two tablets) to each of 120 lambs in only 45 minutes, without undue haste. Taking into consideration the greater safety of the tablet over the liquid method we are of the opinion that the tablet method is the better, although on account of the necessity of using a special balling gun the liquid may prove the more generally useful preparation.

Cattle can easily be treated by the administration of a liquid or of a draught made from tablets allowed to disintegrate in water or gruel.

GENERAL USEFULNESS.

The general advantage of this new anthelmintic may be listed as follows: (1) very high efficiency for certain parasites, (2) remarkable lack of toxicity, (3) lack of taste, (4) cheapness, (5) no previous preparation being required, (6) no subsequent purgation required. Against advantages the following two disadvantages only can be set; (1) its bulky nature, and (2) the appearance of the red dye thionol in the urine for some three days after the administration of phenothiazine.*

The production of thionol in the urine is the only one of these points that calls for mention here, the others having been dealt with. It is, of course, always advisable to warn the owner of the treated animals about the appearance of this dye in the urine as it may easily be mistaken for blood and cause alarm where the warning has not been given; apart from this, however, the consequent staining of the wool may be regarded by sheep farmers as a distinct drawback to the general use of phenothiazine, as thionol is a very fast dye and the stain is likely to remain on the wool for some time. As yet no suggestions have been made as to how this objection may be overcome.

There seems to be little doubt that phenothiazine will come into general use for the control of parasitic gastritis in sheep for which it has considerable advantages over any other known anthelmintic and it is felt that further trials will establish its usefulness for the same disease in cattle, in which animals parasitic gastritis is still without a satisfactory treatment. Australian and American workers have demonstrated its usefulness for the expulsion of oesophagostomes from sheep and some data collected by McEwen and Taylor but not published here, have shown a marked action on *Chabertia*. Its greatest use, may, however, prove to be in the treatment of strongylosis in equines, where it can be relied upon to exert a 100 per cent. efficiency. If the safety of this treatment is also taken into consideration there seems to be every reason for its frequent and regular employment in horses and it is by no means too extravagant to suppose that by regular dosings every two or three weeks it may prove possible to eradicate the infestation from certain environments, a procedure which could not previously have been contemplated with hope of success.

Summary

Phenothiazine is shown by the tests reported in this symposium, on some 150 horses, to be remarkably efficient against the strongyloid parasites

* The danger should also be kept in mind of the coloration of the carcass, and particularly the kidneys with thionol as the result of giving a large dosage to the lambs up to three days before slaughter.

in the large bowel of these animals, a dose of 30 to 40 grammes proving to have an absolute efficiency of 100 per cent for adult worms.

The ease of administration and the safety of the drug are such that the eradication of red-worms from well-managed studs now appears to be a possibility.

Phenothiazine is also remarkably efficient against the stomach worms associated with parasitic gastritis in ruminants, as demonstrated by the several observations involving some 300 to 400 sheep, 70 to 80 goats and a dozen cattle. In the small intestine of these animals it is less efficient but removes about 80 per cent of the trichostrongylid parasites there, with the exception of *Nematodirus*, on which it exerts very little action.

There is no action against *Fasciola* nor against the anoplocephaline cestodes *Moniezia* and *Anoplocephala*.

Ten grammes appears to be an adequate dose in sheep or goats although doses of 20 to 30 grammes are more likely to produce the maximum effect.

Cattle respond well but are much less tolerant of the drug than are sheep or horses.

Experiments on pigs and dogs have been few but it is clear that although the drug acts well on ascarids in the horse its action against these parasites is uncertain in the pig and is absent in the dog.

The anthelmintic effect noted on sheep that have been more or less heavily infested with stomach worms has been extraordinarily good and, where comparisons have been made, has generally been superior to that of copper sulphate and nicotine sulphate.

The tolerance of sheep and goats is very high, 400 grammes causing no ill effect : horses withstand up to 17 times the anthelmintic dose.

Some evidence of idiosyncrasy has been observed in that a group of goats showed some sensitivity to the drug on one occasion and on a later occasion proved to be very resistant to toxic action.

Repeated small doses are considerably more toxic than are occasional larger doses, the minimum toxic single dose being about forty times as great as the minimum toxic dose when repeated daily.

The tasteless character of phenothiazine is a great advantage in that horses will take it voluntarily in the food ; pigs and sheep may also be dosed in this way.

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CATTLE-POISONING BY SORGHUM VULGARE

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Hydrocyanic acid is found in a large number of plants some of which are used as green fodder for cattle but the amount of hydrocyanic acid contained therein being small, they do not usually produce any untoward effects. But cases of accidental fatal poisoning by such plants are not rare in Bengal and Behar and possibly in other provinces.

Sorghum vulgare is an important millet belonging to the N. O. Gramineae, and is cultivated in Bengal, Behar and other provinces as a green fodder for cattle and also for its seeds, known as "jowar" or "junuri" or "gama" which is taken by poor people as a substitute for wheat, rice or barley in making bread. Sorghum may grow to a height of about 7 or 8 feet (including its ear-heads or flowering tops) and looks like maize plant.

The seedling or young tender plant is known to be poisonous even by village people, and cow-boys take good care of their cattle when grazing near about the places where sorghum is cultivated. The grown up and mature plants are, on the other hand, harmless and so also the earheads and the seeds. The mature plants with their leaves and stems are chopped into small pieces and used as fodder. The cattle are particularly fond of the stem even if it is thick and hard.

This investigation was taken up to find out which part of the plant, and at what stage, contains the maximum amount of the poison that proves fatal to cattle. Specimens were obtained from the district of Nadia (Bengal) at different stages of its growth and also from Behar through the courtesy of the Veterinary Disease Investigation Officer, Patna. Subsequently it had to be grown in the garden attached to the laboratory to study it from its germinating stage.

The poison found was, as expected, hydrocyanic acid and the maximum amount was obtained in the sprouts (plumules and radicles)

about 72 hours after germination, that is, when it was about one inch in length. After this stage the amount of hydrocyanic acid begins to decrease continuously and comes down to about a trace or nil when the plant grows to its full height and begins to flower (*vide* Table I).

Table I

Hydrocyanic Acid content of different parts of the plant at different stages of its growth. Figures indicate percentage of hydrocyanic acid in fresh materials :—

	Height of the plant.					
	1" - 2"	3" - 5"	6" - 8"	10" - 12"	16" - 36"	Mature plant at full height.
Roots ...	—	0.028	0.028	0.024	0.024	0.018.
Stems ...	0.297	0.150	0.080	0.012	0.010	trace ; nil.
Leaves ...	—	—	0.009	0.008	0.004	trace ; nil.

The plant with a stunted growth yields comparatively more hydrocyanic acid than that growing vigorously in a damp place. The secondary growths, that is those growing from the roots and stumps after the first crop is cut away, do not yield a larger amount of hydrocyanic acid as it is usually believed. The amount present in the roots appears to be fairly constant, irrespective of the age, size and growth of the plant, upto a certain limit after which it goes down considerably but never to the same extent as in the case of stems or leaves. The leaves contain a very small amount in comparison with the stems and roots. The flowers and seeds do not at all yield any hydrocyanic acid (*vide* Table II).

Table II

Figures indicate percentage of hydrocyanic acid in fresh materials.

Flowers.....nil.

Seeds.....nil.

Germinating seeds just sprouting (after 24 hrs)...0.065.

(after 72 hours.)

Germinating seeds

Plumules.....0.462.

Radicles0.020.

Cotyledons0.018.

Hydrocyanic acid is not present in sorghum as free acid or as a simple compound with an organic or inorganic base but as a cyanogenetic

or cyanophoric glucoside known as *dhuririn* ($C_{14}H_{17}O_7N$) or para-hydroxy-mandelo-nitrile glucoside (Armstrong & Armstrong, 1931). If fresh roots, stems or leaves are crushed and immediately subjected to the usual chemical processes of extraction of Hydrocyanic Acid, none or only a trace of it is detected. If on the other hand they are crushed and soaked in water for 2–4 hours at the temperature of the room (summer) and then extracted, the maximum yield of the acid is obtained. Mineral acids and alkalies in concentrations higher than N/40 retard the process of hydrolysis rather than help it in any way (*vide* Table III). If treatment with water is prolonged for 24 hours or more, the yield of HCN often becomes less on account of conversion of a portion of it into formates by another process of hydrolysis.

In a previous communication on the action of enzyme 'linase' on linamarin (a glucoside present in common linseed), it has been shown (Bagchi & Ganguly, 1939) that the enzyme linase acts best in water or in very slightly acidulated water (below N/40 concentration) and its action is completely retarded by normal solution of acids or alkalies. It appears that exactly similar phenomena happen in the case of this glucoside present in *Sorghum vulgare*.

Table III

Effect of water, acids or alkalies on hydrolysis of Cyanophoric glucoside present in sorghum. The figures indicate percentage of Hydrocyanic Acid in fresh materials :—

	Water 4 hours	Water 24 hours	N/40 HCl 4 hours	N/10 HCl 4 hours	N/40 NaOH 4 hours	N/10 NaOH 4 hours
Roots	0.028	0.022	0.020	nil	0.012	nil
Stems	0.150	0.147	0.085	trace	0.021	nil

The fact that the maximum of only 0.150 per cent of HCN can be extracted from *Sorghum vulgare* of the size (3"–5") which cattle are likely to graze on, accounts for comparatively few fatal cases of cattle-poisoning by this plant. It is stated that a dose of 20 grains of hydrocyanic acid is fatal to a bullock (Linton, 1927) and as such about 2 lbs. of sorghum would be required to produce the fatal effect, assuming that 0.150 per cent of hydrocyanic acid is present in it. This may only be possible if sorghum is not more than 5" in height and the animal grazes in the sorghum field sufficiently long to ingest 2 lbs. of this stuff — a possibility not very common in ordinary circumstances prevailing in the villages. But it is known that the amount of this poison in the sorghum may be increased by drought, changes in the condition of the soil and other factors and as such smaller quantities of sorghum may prove

fatal. Besides, the diminutive size of Indian cattle, specially in Bengal, with poor physique and nourishment, will not ordinarily require 20 grains of Hydrocyanic Acid for a fatal dose as worked out by the European workers.

The detection of hydrocyanic acid in the stomach-contents in such cases of cattle-poisoning is of medico-legal importance. Whether it is an accidental case of poisoning by sorghum or any other HCN containing grass or due to administration of cyanides by the professional cattle-poisoners is a matter for careful investigation by the analyst.

The observation that normal solutions of acids or alkalies retard the production of hydrocyanic acid from the glucosides, may be utilised in treating suspected cases of poisoning caused by this plant. If a heavy dose of an alkali such as sodium carbonate (washing soda) which is available in these days even in remote villages, be administered to the affected cattle soon after they feed in a sorghum field, may prevent the fatal effect.

The facts that the hydrochloric acid-content of the true stomach or abomasum of cattle is very low and the reaction in the other compartments of the stomach is neutral or slightly alkaline in healthy and fasting animals (Smith, 1921), indicate that the stomach, except the true stomach, is an ideal place for rapid hydrolysis of the cyanophoric glucosides and production of the maximum amount of hydrocyanic acid. As retention of food in the stomach of ruminant animals is fairly long, timely administration of a suitable dose of soda may prevent completely the production of HCN in the alimentary tract. In abomasum the reaction being acid due partly to hydrochloric but mainly to lactic acid, the production of this poison in an appreciable amount is not likely to take place and if the ingested food, before it reaches the neutral compartments of the stomach where hydrolysis takes place more quickly, is made strongly alkaline, the danger may be averted. The normal solution of sodium carbonate which prevents hydrolysis contains 0.53 gramme in 100 c. c. or about 2.5 grains in an ounce of water. A pint or more of a strong alkaline solution containing 4 to 5 times the calculated amount of soda is likely to render the whole of the stomach contents alkaline and thus to prevent the hydrolysis.

A careful investigation on this line with experiments on animals may prove the usefulness or otherwise of our suggestion which is, of course, based on theoretical grounds and on experiments *in vitro* which sometimes differ widely from those carried out *in vivo*.

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Editorial

WANTED—A CHANGE IN POLICY

In an essentially agricultural country like ours where the majority of the agricultural operations are being carried out with bullock power, it has been a matter of great concern that the agriculturist is not getting adequate timely veterinary aid. Our attention is being constantly drawn to the extreme inadequacy of veterinary help in the rural tracts of the country and also to the desirability of utilising the existing veterinary staff to better advantage to the ryots. While we must admit that the deficiency in numerical strength cannot be made good all at once and that it can be augmented only by gradual additions, we think there is a good deal of force in the suggestion that the disposition of the present available staff could be easily bettered.

The policy of the Veterinary Departments in the different Provinces of this country was laid down years ago when the Departments were first organised. At that time, western system of veterinary medicine was a novel thing to the ryot. As is well known, he is ignorant and illiterate: he had been used to associate the epidemics of cattle diseases with the wrath of the village deity; and he had not even the remotest idea about the prophylactic measures to be adopted in outbreaks. As such, in the initial stages of the organisation, it was found necessary to do a good deal of propaganda work to secure the goodwill and confidence of as many people as possible, especially of the more influential persons in the outlying tracts. These had to be visited

periodically to get the ryots interested in veterinary matters. They had to be told over and over again about the importance of prophylactic measures whenever epidemics broke out. They had to be educated about veterinary Hygiene and about the necessity of promptly seeking veterinary aid in all cases of diseases of livestock. To achieve these objects, a corps of Touring Veterinary Officers was first organised : in fact, that was the beginning of the Veterinary Department. These officers had to do a lot of touring work more with the object of popularising the Department than with the object of doing any real professional work. The treatment that they gave to animals in the course of their tours was more in the nature of a first aid. They had neither the equipment nor the facilities for undertaking the treatment of serious or sub-clinical cases which by their very nature required careful observation, detailed examination and sustained attention. However, as years rolled by, the confidence of the ryot was gradually gained chiefly by the convincing manner in which outbreaks of contagious diseases were controlled and prevented. Naturally, this created a greater demand for veterinary aid. In course of time, this demand was met by the opening of veterinary hospitals in cities and towns and also by the creation of more touring billets with smaller jurisdictions. It is thus that the Department has been expanding steadily during the past few years. And, now, a stage has been reached when demands for sustained intensive veterinary work in smaller towns and rural tracts have become more and more insistent. The time is, therefore, opportune to review the policy adopted so far and plan the disposition of the existing veterinary staff to the best advantage of the ryot.

Almost the very first thing that strikes one is whether it is still necessary to have these Touring Veterinary Assistant Surgeons to carry out the work which, in the initial stages of the organisation of the Department, was found necessary. Is it not time that these officers were allowed to settle down and do sustained work, especially in the rural tracts where the cry is

for more and more veterinary aid? Will it not be enough if propaganda work is confined to organisations of exhibitions during big fairs and festivals where large congregations assemble? The consensus of opinion is for the abolition of the system of the Touring Veterinary Assistant Surgeons which has practically outlived its original purpose and for utilising the services of these officers for the opening of veterinary hospitals in smaller towns and more important villages. If this is done, it will not only enable the ryots to get prompt veterinary aid in times of their need but will also help the Veterinarian to do real professional work. As things are at present, a Touring Veterinary Assistant Surgeon who has necessarily to tour for a minimum period of at least 20 days in a month soon gets rusty for want of opportunities to practice his profession. The present day veterinary education is of a high standard: and it would be a great pity if such kind of education is not put to its proper use. Problems affecting the livestock vary from locality to locality and the opening up of veterinary institutions in rural tracts will facilitate the study of these problems to a satisfactory issue.

We may here mention that, in some places, there are veterinary institutions which are called "dispensaries with touring work." The officer in charge of such a dispensary often goes out on tour with the object, we are told, of popularising the institution and canvassing cases for treatment. During his absence, either the compounder or the attendant remains in charge. How such an arrangement can ever make a veterinary dispensary popular has been a problem to us. The experience of those whose opinions ought to count in these matters has been otherwise. Such an arrangement tended to make a dispensary more unpopular than popular. The popularity of an institution depends upon the good work done there; in the absence of it, no amount of canvassing can possibly bring in cases for treatment. On the other hand, the method adopted only contributes to making the institution still more unpopular. Ryots come from far off places with their animals for treatment and very often find the Doctor away. An experience like that,

especially when it gets often repeated, soon makes any one hesitant to bring in cases: even cases from nearby places will soon stop attending when the owners find the Doctor 'out' all too frequently. There is also the danger that the *locum tenens* in the person of the compounder or the attendant may overstep his limitations and pose as a doctor and further help to discredit the institution. And, therefore, this policy has very little in favour of it and has, in fact, every thing against it. It is high time that this is changed and the touring work taken away from the officer in charge of an institution.

VETERINARY PUBLIC HEALTH IN MUNICIPALITIES

I

In the Province of Madras, Veterinary Surgeons holding charge of Government or other veterinary hospitals in Municipal limits are required to attend to a few of the public health problems in the area. We shall in this *issue*, confine our remarks to only one such item, *viz.*, the quarterly inspection and submission of reports on the working of the Lethal Chambers intended for the humane destruction of unclaimed and stray dogs which would otherwise prove a great menace to men and animals in the locality. This service rendered by the veterinary surgeon is quite free of cost to the Municipality which constructs, maintains and manages these Chambers of destruction through its Health Officer or Sanitary Inspector. The location, generally, of these buildings, is outside the town and in filthy areas, the construction itself rarely coming up to the scientific standard prescribed for the purpose of their efficient and economic use. The Veterinary Surgeon is expected to watch the Chamber *at work* to know that it has been working satisfactorily but in practice he rarely gets notice of the intended use of the Chamber to enable him to be present there while it is put to use. Often times, it is difficult for him, in spite of his repeated and timely requests, to get the necessary figures from the Municipality as to the number of dogs killed in it and the number of times the Chamber was put to use during the quarter and the year,

as this information is to be included in his quarterly inspection and annual reports. For several months at a stretch, some of these Chambers are not put to use; and, in a few others they are not only not worked but are unworkable and dilapidated. The remarks and suggestions made by the Veterinary Surgeon, in the reports forwarded through his District Veterinary Officer, rarely receive the attention of the local Municipality, until and unless a District Collector and Magistrate intervenes in the matter at the instance of the local Veterinary Surgeon.

These defects in an otherwise useful system, can be surely rectified if the heads and sub-heads of the Public Health and Veterinary Departments, include an inspection of these Chambers in their programme during their inspection tours and visits to the Municipalities, enquire into the action taken by the authorities on the remarks of the Veterinary Surgeons in their inspection reports and otherwise take effective steps to improve the present deplorable state of affairs.

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Clinical Articles

THE TREATMENT OF BOVINE MASTITIS

BY

V. D. RATNAM, G.M.V.C.,

Veterinary Assistant Surgeon on Glanders Duty,

MADRAS.

It is well known that Mastitis in cows is due to infection and that the correct line of treatment of such cases would be to try to remove, destroy or inhibit the growth of the causal organisms. In practice, however, this ideal is almost impossible to achieve. So the clinician is driven to the necessity of finding other ways and means of combating the disease, which may be palliative rather than curative. The writer of this article had many opportunities of treating Bovine Mastitis in the City of Madras amongst milch cattle in large numbers and he has met with both failures and successes. In Madras, Mastitis occurs more often in cross-bred cows and in Delhi buffaloes than in other breeds like Ongole and local bred cows for the simple reason that the former are heavy milkers. With large distended udders and with well developed teats, the calibre of the milk-duct must be comparatively larger than the ordinary cows—hence it is more easily exposed to external infection than other animals. It will be generally agreed if I say that in more than 75 per cent. of cases Mastitis is due to external infection.

As regards the treatment of these cases, there are ever so many drugs which are used both externally and internally. The writer from his experience has found the following treatment to give satisfactory results in cases where he has been fortunate enough to have treated them successfully. In the initial stage, when discolouration of milk (blood tinged) is observed with high temperature and local swelling of the glands, the following treatment was found to give encouraging results.

Treatment :— Externally, a paste consisting of common salt and *Acalypha Indica* or *A. Spicata* or *A. Ciliata* or *A. Canescana*, (N. O.—*Euphorbiaceae*) (Tamil — Kuppamani, Tel — Kuppichettn, Can.— Kuppi-gida, Mal.— Kuppumani.) grounded well and applied twice a day (both morning and evening) on the inflamed udder, after stripping it completely. Internally, one drachm of Formalin and 4 oz. of sodium chloride in one pint of water both morning and evening.

In other cases where the liquid drawn from the udder is more or less purulent and foetid with a tendency to pus formation, infusion of several drugs into the glands were tried—drugs such as Hydrogen Peroxide, Boric Acid, Mercury Lotion, Entozoan, Acriflavin and other antiseptic lotions. Of all the drugs, Acriflavin has given the most satisfactory results. Even the much advertised German drug Entozoan is not found so good as Acriflavin. The udder is first completely stripped and then, Acriflavin lotion, 1 in 1000, is infused into the gland and kept there for 24 hours; and this has to be repeated once in 24 hours till the pus formation stops. Externally gentle rubbing of Iodine Ointment is done daily. Also intravenous injections of Iodine (strength 5 grs. of Iodum, 10 grs. of Pot. Iodide in 20 c.c. of distilled water) once a day for 3 or 4 days. This line of treatment seems to give the most satisfactory results.

I have not seen much of gangrenous Mastitis, nor any fatal cases of Mastitis in Madras. Abscess formation of the gland appears to be very common and as a result of this suppuration, the gland is completely lost. Once the formation of abscess is noticed, interference with the knife is the best treatment. The case has to be treated as one of an ordinary abscess when it usually yields to ordinary antiseptic treatment. In a few cases there is no apparent abscess formation in the gland, but the discharge of pus continues for a prolonged period resisting all treatment. This is due to the fact that we are not able to get at the suppurating foci in the gland. As we have to syringe through the narrow teat, we are not able to drain and wash the cavity completely and satisfactorily. In three such cases I had to go on with my treatment of infusing antiseptic lotions for nearly 2 months. Then I got tired of the treatment I was giving, but fortunately the owner was not tired of sending these animals for treatment every morning. So I made up my mind to experiment on these animals in some other way. I passed the teat syphon into the teat and made an opening on the lower side of the gland, just one inch from the base of the milk teat. The teat syphon was seen through this opening. The glands were syringed and dressed through this opening. The pus formation stopped and the wound also healed quickly.

The much advertised Sulphonilamide tablets were tried in many cases. This treatment has to be given for a pretty long time and the cost of the drug seems to be high, so much so that the owners get tired of this prolonged treatment. Even then this treatment was found to be successful only in a very few cases.

Prontosil was tried and found to give good results in conjunction with the local treatment only in a very few cases.

This is probably due to the fact that most of the Mastitis cases in Madras are not due to Streptococci infection.

DISTEMPER

BY

K. S. PRAKASA RAO, G.M.V.C.,

Veterinary Assistant Surgeon, Bezwada.

I have been treating cases of distemper in dogs with the intravenous injections of Pot. Permanganas freshly prepared and I am glad to say that the results obtained so far have been encouraging. Four of such cases are described below for the information of the profession.

Case No. 277 :— A black and white Spaniel bitch, aged 2 years, was admitted in the Veterinary Hospital, Bezwada, as an out-patient on 30—4—40; Temperature 105.6°F. There was a nasal catarrh with a thick purulent discharge. The animal was dull and refused food completely for the previous 3 days. Mucous membrane injected. The eyes were filled with purulent discharge and the cornea was dull. Bowels constipated; pustules were visible inside the flank and thighs. Muzzle was hot and dry and the discharge was found caked at the nostrils to the extent of blocking them. There was an occasional cough.

Treatment :— The following mixture was given :—

Sodii sulphas grs. xxx, Spirits aetheris nitrosi mxxv, aqua $\overline{3}$ ss.

1—5—40. Temperature 105.2°. The above mixture was continued.

2—5—40. Do 105.0°. Condition same as on the previous day, no appetite — The animal refused to take food voluntarily but would take a small quantity of milk and the following mixture was given :—

Mistura Febrifuge $\overline{3}$ i , Vinum Ipecac. mV.

3—5—40. Do 105.0°. No improvement but mucus from the nostrils was expelled freely. Febrifuge mixture with Vinum Ipecac was continued.

4—5—40. Do 105.0°. The condition was same as on the previous day. Febrifuge mixture with Vinum Ipecac was given.

- 5—5—40. Temperature 104.6°. There was slight improvement in cough. Previous day's treatment was continued.
- 6—5—40. Do 105.6°. Condition was getting bad. Breathing became more difficult. The animal having refused to take food voluntarily, small quantities of milk beaten with white of the egg was administered slowly and carefully in order not to set up coughing. 1 c.c. of 1 in 400 solution of Potassium Permanganate freshly prepared was given intravenously. Febrifuge mixture with Vinum Ipecac was also continued.
- 7—5—40. Do 104.4°. The animal looked better. Cough was not very oppressive. The animal looked active. Two ounces of milk with white of egg was continued.
- 8—5—40. Do. 105.0°. Cough was much better. The animal was active. Took a small quantity of milk. Bowels moved freely. Continued the usual Febrifuge mixture.
- 9—5—40. Do. 104.4°. The mixture of the previous day was continued.
- 10—5—40. Do. 103.0°. Continued the mixture and a second dose of Pot. Permanganate was given by the intravenous route.
- 11—5—40. Do. 103.0°. Continued the mixture.
- 12—5—40. The animal was not brought to the hospital.
- 13—5—40. Do. 102.0°. The animal was distinctly better. Continued mixture only.
- 14—5—40. Do. 101.4°. The animal was lively. Continued the mixture only.

The animal was discharged cured.

2. *Pup.*—Case No. 468, aged 1 year. It was admitted on 19—5—40 as an out-patient in a rather weak condition. Breathing was difficult. There was a thick purulent discharge from the nose and eyes. Mucous membrane

injected. No appetite. Bowels constipated. Temperature 104°. There were pustules inside the flank and thighs.

Treatment adopted :—2 c. c. of freshly prepared 1 in 400 solution of Pot. Permanganus was injected intravenously. One ounce of Febrifuge mixture was also administered orally.

20—5—40. Temperature 103·4°. The animal was active. Continued the Febrifuge mixture.

21—5—40. Do. 103·2°. Continued only mixture,

22—5—40. Do. 103·0°. Continued only mixture.

23—5—40. Do. 103·0°. There was slight cough. Gave Vinum Ipecac m V in syrup 3i.

24—5—40. Do. 102·4°. Continued the above as electuary.

25—5—40. Do. 103·0°. Cough improved. The animal was lively. Continued the above electuary.

26—5—40. Do. 102·4°. More improvement was noticed. The animal was lively. Continued the above electuary. The animal was discharged cured.

3. *Bitch*.—Case No. 533, aged 1 year.

History :—The animal was said to have been keeping indifferent health with discharge from the eyes and nose and with no appetite for the last 3 or 4 days.

Symptoms :—She was brought to the hospital on 30—5—40 with 105·0°F. temperature. She had a dull look. There was slight cough. Eyes were filled with mucous discharge. Mucous membrane yellowish. There was running from the nose. Bowels constipated. The skin inside the thighs presented minute congested, circular spots here and there. Blood smears were submitted to the Madras Veterinary College (Result:—No organisms present).

Treatment :—Gave 1 c. c. of 1 in 400 solution of Pot. Permanganas, freshly prepared, intravenously. Febrifuge mixture 1 ounce was also given.

1—5—40. Temperature 102°9. The animal looked better, Vinum Ipecac in syrup was given as there was cough.

1—6—40. Do. Do. Continued the above mixture.

- 2—6—40. Temperature 102.9°. Bowels did not move. The animal was lively. Sodii sulphas $\frac{3}{ss}$ was given along with febrifuge mixture.
- 3—6—40. Do. 102.2°. Bowels moved slightly and the animal took some milk. Continued sodii sulphas in febrifuge mixture.
- 4—6—40. Do. 101°. Bowels moved freely. Lapped some milk.
- 5—6—40. Do. 102.4°. Continued febrifuge mixture.
- 6—6—40. Do. Do. Do.
- 7—6—40. Do. 102.2°. Do.
- 8—6—40. The animal did not attend the hospital.
- 9—6—40. Do. 101.0°. Continued febrifuge mixture.
- 10—6—40. Do. 103.0°. The intravenous injection was repeated and the following mixture was administered :—
Pot. Chloras grs. v; Tr. Camphor Co. mX;
Vinum Ipecac miii; Tr. Scilla miii
Spts. Chloroform mx aqua ad $\frac{3}{4}$ i
- 11—6—40. Do. 102.0°. Continued the mixture.
- 12—6—40. Do. 102.2°. Tr. Camphor Co $\frac{3}{ss}$ in syrup was given.
- 13—6—40. Do. 102.0°. Continued the electuary.
- 14—6—40.
to
22—6—40. The electuary was continued and the animal discharged cured.

4. Dog :—Case No. 568, aged 1½ years.

History :—The dog was stated to have been off his food for about a week. There was a dry cough.

Symptoms :—He was admitted on 5—6—40. Breath was offensive. Eyes and nose were filled with purulent discharge. Mucous membrane brick-red in colour. Bowels normal. There was chorea affecting the masseter muscles. Temperature 103.8°F. The animal was weak. There were healed circular areas in places of pustules inside of the thighs.

Treatment :—2 c.c. of 1 in 400 sol. of Pot. Permanganas was given intravenously and in addition, the following was administered: Vinum Ipecac mV in syrup $\frac{3}{i}$.

6-6-40.	Temperature	103.2°.	Continued the electuary.
7-6-40.	Do.	102.0°	Do.
8-6-40.	Do.	101.4°.	Do.
9-6-30.	De.	102.0°.	Do.
10-6-40.	Do.	102.0°.	Do.
11-6-40.	Do.	101.6°.	Do.

The animal was discharged cured. Although the animal recovered from the disease there was no marked improvement in the chorea sym-toms.

MANGE

BY

V. PARAMESWARA MENON, G.M.V.C.,

Touring Veterinary Assistant Surgeon, Manjeri.

The treatment advocated by Dr. C. Gorovety of Palestine for the different varieties of Mange was tried at the Veterinary Hospital, Mangalore, in 37 cases, during a period extending over seven months, commencing from the first week of December 1939 and ending with the last week of June 1940.

All the cases were confirmed positive microscopically at the hospital for mange.

Treatment was completed in eleven cases of Demodectic mange, and three cases of Sarcoptic mange, and they were discharged cured. The rest discontinued treatment after a temporary relief.

Method of Treatment :—The affected animal was clipped and thoroughly cleaned with warm water and soap.

A 10 to 60 percent. aqueous solution of Sodium Hyposulphite was applied vigorously with a stiff brush, and the patient allowed to dry. When completely dry, fine crystallised Sodium Hyposulphite in the form of a whitish powder appeared on the surface of the skin as a thin coating of film.

A 3 to 6 per cent. solution of Hydrochloric Acid was then applied in a similar manner, using the same brush.

In bad and severe cases, the treatment was once again repeated on the same day; half a dozen applications of the two solutions were found adequate in most of the cases to complete a cure. The patient was bathed

only three days after the final dressing, when all the parasites as well as their eggs were found destroyed.

The chemical reaction is the liberation of the anhydrous sulphurous acid, and the nascent sulphur in a pure state, which are the active agents in this line of treatment, having high oxidising properties causing the destruction of the mites and their eggs.

It took about 3 to 10 days, and 2 to 6 applications on an average to bring about a complete cure. The longest time taken for the complete course of treatment in a pup with *Demodectic* mange was 23 days, and the maximum numbers of applications required in another case was 14. In a case of *Sarcoptic* mange in a Mongreal dog, two applications only during a period of three days were found sufficient to effect a cure.

Symptoms:—Demodectic Mange: Two types were observed — dry and moist. The affected portions in the dry or scaly form were denuded of hair either partly or completely. Skin either reddish or bluish. In early cases, it was chiefly reddish, and in long standing and chronic cases, it was either wrinkled, or corrugated having a bluish, or slatish appearance, with almost practically hairs denuded bald patches.

In the moist or pustular type, small cutaneous abscesses, or pustules etc. involving sebaceous glands were often noticed; the breaking of these abscesses or pustules caused matting of the hairs with their discharge, and giving a dirty odorous moist or weeping ezematic looking appearance.

In both the types, one characteristic feature was the conspicuous absence of pruritis, itching or scratching sensation; or if present it was very light.

Sarcoptic Mange:—In the majority of these cases that came under hospital notice in canines, inflammatory patches on the affected parts with wrinkled skin and shedding of hairs were noted invariably, associated with acute pruritis. Hind quarters, croup and extremities were chiefly affected. The exudate oozing out from the affected parts forming thick reddish brown crusts on the surface, accompanied by intense irritation, causing the animals to lick, rub or scratch violently, leading to fresh infection of new sites, was also observed.

In a heifer calf, that did not complete the full course of treatment, her neck, shoulder and hump were the principal sites affected. The skin of these parts was thickened, wrinkled, corrugated, having small minute ridges intervening. There was shedding of crusts and epithelial scabs and the animal rubbing against the walls, trees and stall fixtures, etc.

Statement of mange cases treated at the Mangalore Veterinary Hospital, from 7-2-40 to 10-5-40.

The cases that underwent a complete course of treatment, and discharged cured, are detailed below.

Serial No.	Registered case number.	Kind of animal.	Date of Admission.	Variety of Mange.	Treatment		Dates of Dressings with no. of Dressings.	Total no. of dressings.	Duration of treatment in days.	Result of Treatment.
					(a) Strength of Aqueous Solu. of Na ₂ SO ₃ used	(b) Strength of HCl. used				
1	2	3	4	5	6 (a)	6 (b)	7	8	9	10
1	2489	Terrier Pup	7-2-40	Demodectic (Dry)	10%	3%	7th, 8th, 9th & 11th 1 dressing a day	Four	Five	Cured.
2	2599	Terrier Dog	19-2-40	do	60%	6%	19th 2 dressings 23rd 1 dressing 25th do	Four	Seven	Cured.
3	2613	Mongreal Dog	20-2-40	do	40%	5%	20th 2 dressings 22nd 1 dressing 24th 1 do 26th 1 do	Five	Seven	Cured.
4	2117	Terrier Dog	21-2-40	do	40%	5%	21st 2 dressings 23rd 1 dressing 24th 1 do	Four	Four	Cured.
5	2767	Terrier Pup	11-3-40	do	50%	5%	11th 2 dressings 15th 1 dressing 21st do 24th do 29th do	Six	Eighteen	Cured.
6	147	Mongreal Dog	17-4-40	Demodectic (Moist)	50%	5%	17th 2 dressings 20th 1 dressing	Three	Four	Cured.
7	164	Pi-Dog	19-4-40	Demodectic (Dry)	50%	5%	19th 2 dressings 23rd 1 dressing 27th do	Four	Nine	Cured.

	No.	Breed	Date	Treatment	Dose	Time	Cured.
8	360	Dachshund Pup	13-5-40	do	50%	5%	Ten
						13th 2 dressings 15th 1 dressing 19th do 22nd do	
9	474	Pi-Dog	29-5-40	Demodectic (Moist)	50%	6%	Eleven
						29th 2 dressings 1st 1 dressing 5th do 8th do	
10	490	Dach-hund Pup	1-6-40	Demodectic	50%	5%	Twenty-three
				(Dry)		11th 2 dressings 23rd do	
11	625	Cocker spaniel Dog	19-6-40	Demodectic (Dry)	50%	6%	Sixteen
						20th 2 dressings 21st 1 dressing 24th do 25th do 26th do 27th do 28th do 29th do 30th do 1-7-40 do 2-7-40 do 3-7-40 do 4-7-40 do	
12	2537	Airdale Dog	12-2-40	Sarcoptic Mange	10%	5%	Five
						12-2-40 1 dressing 13th do 14th do 15th do 16th do	
13	263	Mongreal Dog	2-5-40	Sarcoptic Mange	50%	5%	Three
						2-5-40 1 dressing 4-5-40 1 dressing	
14	336	Mongreal Dog	10-5-40	Sarcoptic Mange	50%	5%	Five
						10th 2 dressings 13th 1 dressing	

Dog

N.B.—Sarcoptic form of mange appears to be more easily amenable to treatment by this method than the Demodectic Type.

CUTANEOUS MICROFILARIA

BY

K. S. PRAKASA RAO, G.M.V.C.,
Veterinary Assistant Surgeon, Bezwada.

Two cases of bovine cutaneous microfilariasis with different clinical symptoms were recorded in the Veterinary Hospital, Bezwada.

Case No. 1.

Subject :— A cross-bred, Ongle bullock, aged 12 years, admitted as inpatient No. 1247 on 5-9-40.

History and symptoms :—The animal had been suffering from pruritis for the previous six months and it had not shown any improvement under local treatment. There was intense irritation. The animal had been carefully protected from rubbing against rough objects, lest it should cause abrasions all over the body.

The lesions were found all over the back and sides, and over the tail in the form of circular patches of varying diameters from one to four inches. The patches were black with a few hairs thinly distributed over each lesion. The skin over the part was thickened. It was very stiff like parchment paper. There was intense irritation. The animal was frequently seen biting the part.

Microscopical Examination :— Scrapings and a section of the skin were examined by the Principal, Madras Veterinary College. There were no mange mites in the scrapings. Section of the skin revealed microfilaria.

Treatment :— The condition of the skin was not far different from that caused by mange mites. Treatment on similar lines was, therefore, adopted. The following medicine was rubbed over the lesions :

R.

Sulphur Sublimatum	2 oz.
Liquor Potash	2 oz.
Kerosine oil emulsion	1 oz.
m. Ft. dressing.	

The above dressing was applied to the skin from 5-9-40 to 10-9-40. The animal was discharged as there was an apparent cure.

Case No. 2.

Subject :—Ongole bullock, aged about 11 years, admitted as inpatient case No. 1789.

History :—The animal had, it was alleged, been bitten by a peculiar fly all over the back and sides which resulted in minute haemorrhages and formation of subsequent abscesses which did not heal.

Seat of occurrence :—Both sides of the dewlap had small abscesses. The prescapular lymph glands were enlarged. There were traces of blood trickling down from minute punctures of the skin and subsequently drying up. The animal had a tendency to lick mud.

Microscopical examination :—Sections of the skin were examined by the Principal, Madras Veterinary College and microfilaria were found in corium.

Treatment adopted :—20 c.c. of 1 per cent solution of Tartar Emetic was given as an intravenous injection on the day of admission on 12-11-40. In addition to it, the following was prescribed :—

Tonic Powder	1 oz.
Pulvis Nuxvomica	1 dr.
Sodium chloride	1 oz.
Copper Sulphate	5 grs.
Aqua	1 Pint.

The above drench was repeated on 13-11-40 and 14-11-40. On 15-11-40 injection of Tartar Emetic was repeated and from 16-11-40 to 22-11-40 the above mixture was repeated.

There was remarkable improvement in the condition of the animal and it was discharged cured.

EPISTAXIS — TREATMENT WITH OXALIC ACID

BY

N. SUBRAMANIAN, G.M.V.C.,

Veterinary Assistant Surgeon, Mayavaram.

A local country-bred medium sized bullock, aged about 6 years, was brought to this dispensary on 20-5-41 with the history that the animal was bleeding from the right nostril for the past two days.

Examination of the nostrils did not reveal any local lesions except the oozing of the blood in jets. Neither was there any history of external violence etc.

Treatment.—Cold water irrigation to the region of the nostrils and forehead for about half an hour gave some temporary relief, the oozing of the blood having ceased for the time.

An hour or two afterwards, the bleeding again commenced coming out in jets as before. In addition to the cold water irrigation once again, an intravenous injection of 12 grs. of Oxalic Acid (a vegetable acid found in rhubarb, sossel etc., plants) in 40 c.c. of aqua distillata was given with the result that the bleeding from the nostril completely stopped within a few minutes of the injection; and there was no further recurrence.

REFERENCES

- 'Control of Hemorrhage by Intravenous Use of Oxalic Acid.'—Journal of the American Veterinary Medical Association, October 1939.

COMPOUND FRACTURE OF THE METATARSAL IN A DOG

By

K. S. SHETTY, G.M.V.C.,

1/C Veterinary Dispensary, Narayanagudam, Hyderabad.

Subject.—Cocker-Spaniel dog aged about 5 years,

Symptoms.—A septic wound probably caused by the hit of a sharp stone at the metatarsal region with profuse swelling of the limb below the hock. The dog was very dull and showed a temperature of 105°F.

Treatment.—The wound was cleaned and two small protruding pieces of bones were removed. Antiphlogestine was applied to the whole part; 5 c.c. of urea sulphazide was injected intramuscularly. The next day the temperature came down to normal and the swelling was reduced. The wound was dressed and bandaged daily for about one and a half months, but it never healed up. Pieces of necrosed bones were seen coming out once or twice. The dog was also given Calcium Lactate internally with no effect. Finally a skiagram of the part was taken. The report was "evidences of Osteomyelitis of medial left metatarsal after fracture; the adjacent metatarsal also shows infarction." On this an operation was decided upon.

Technique.—The part was shaved and prepared antiseptically. A dose of morphine and atropine was injected subcutaneously and locally pantocaine



Photo of the Compound-Fractured Metatarsal in a dog.



Photo of a Hermaphrodite-Transversalis Feminus in a calf
with Imperforate Anus.

solution 1 in 1000 was injected around the wound. The original wound was enlarged, the protruding bones were cut off by the bone scissors and the space in between was nicely curetted by Volkmann's spoon. Another longitudinal incision was made at the region of the adjacent metatarsal and the affected part was also curetted. Finally both the wounds were closed by interrupted sutures. A pad of antiseptic gauze was put on the part and bandaged. Both the wounds healed up with first intention and the dog was discharged within a fortnight after the operation.

Note.—The arrow marks in the photo show the affected part of the bones. (*Vide* Plate No. 9.)

A CASE OF HERMAPHRODITE-TRANSVERSALIS FEMINUS IN A CALF WITH IMPERFORATE ANUS

BY

J. D. DAVID, G.M.V.C., P.G. (EDIN.)

AND

K. M. YAKUB SHAH, G.M.V.C.

A country bred newly born calf was brought to the hospital on 29th August 1940 from Vadavalli village with imperforate anus.

On further examination certain portions of the sexual organs were present in the calf. It was found to have undeveloped testicles in the inguinal region. The vulva was present with the absence of a clitoris, lined with mucous membrane and a small hole representing the urethral opening through which urine passed in spurts. The penis was absent, but a small fibrous functionless cord was present; thus showing that the external generative organs belonging to the female being more predominant while the internal organs of the female were imperfect.

The imperforate anus was operated and treated successfully.

The photo of the calf seen here illustrates the condition.

(*Vide* Plate No. 10.)

College News

MADRAS VETERINARY COLLEGE

Supplemental-Examination Result.

The following students have passed the Diploma (Supplemental) Examination, held in October 1941 and have been awarded the Diploma of 'Graduate of the Madras Veterinary College (G.M.V.C.)' arranged in the order of merit :—

- I. Nagaraja Rao, G. V.
- II. Ravi Varma Hedge, V.
- III. Subbarama Rao, V.
- IV. Vedanayagam, A. R.

MADRAS, }
9th October, 1941. }

M. R. V. PANIKKAR, B.Sc., M.R.C.V.S.

Principal.

Abstracts

NASAL SCHISTOSOMIASIS IN GOATS. BY P. G. MALKANI, B.A. (HONS.), B.Sc. (LOND-VET.), M.R.C.V.S., AND G. PRASAD, G.B.V.C. *Ind. J. Vet. Sci. and Anim. Husb.* VOL. XI, PART II.

The authors record the incidence of Nasal Schistosomiasis in goats and that *Schistosoma* responsible for this disease in goats is identified with *Schistosoma nasalia* (Rao, 1932). The chief clinical manifestations were sneezing, coryza, congestion of and growths on the nasal mucosa and difficult respirations. The attacks of sneezing were fairly frequent. The coryza was slight and bilateral. The discharge was intermittent, small in quantity and either mucopurulent or sanguinolent. Congestion and the pimply growths were easily seen in both the nasal fossae. The growths were more or less confined to the alae nasi and the septum nasi. The growths were more or less confined to the alae nasi and the septum nasi. The growths were small and did not extend beyond an inch or so. At rest the respiratory distress was slight, on exercise it became marked. The sound emitted was not so loud as heard in bovine nasal schistosomiasis. Of the two cases that came under notice, one was a male and the other a female. It is concluded that the goat like the buffalo must therefore be taken into consideration in the eradication campaign against the more common Bovine Nasal Schistosomes.

RIBOFLAVIN DEFICIENCY IN POULTRY BY F. D. ASPLIN., M.R.C.V.S.,
DIP., Bact. Vet. Jour. VOL. 97, No. 1.

The importance of the vitamin B₂ complex in the nutrition of poultry has been extensively studied in the United States. It has been shown that at least three of the component factors are essential for normal health and development of the chicken, viz. :

Riboflavin, necessary for embryonic development, growth and the prevention of leg weakness (so-called curled toe paralysis).

Pantothenic Acid (Filtrate Factor), chick antidermatitis factor.

B6 (Pyridoxine), necessary for growth of chicks and maintenance of weight in adult birds.

In this article the author presents some data about Riboflavin deficiency and stresses its economic importance in poultry breeding. Inadequate Riboflavin in the diet of breeding hens results in loss of hatchability while the symptoms of this deficiency are as follows :—

“The onset is usually sudden. It is noticed that the affected birds have difficulty in using their legs. They tend to sink down on their hocks so that the shank is flat on the ground. The leg weakness becomes more obvious if the birds are forced to run around the pen a few times. As the foot comes into contact with the ground the toes twist inwards and together. If the leg weakness progresses the birds become unable to lift their hocks from the ground so that they walk on their shanks. At this state the toes are flexed and twisted inwards and together ; hence the name “curled toe paralysis” has been applied. The twisting of the toes is a symptom of diagnosis value.

In attempts to induce the deficiency experimentally it has been noted that the growth rate was poor, but that normal growth took place when riboflavin supplements were given.

As recovery is taking place some birds will appear to stand on their toes with their hocks fully extended, so that the tibeo-tarsus and tarso-metatarsus form almost a straight line.

Symptoms indicating involvement of the central nervous system are entirely lacking. There is no loss of equilibrium. Although the bird may be unable to lift its hocks from the ground there is no tendency to topple

over and struggle on its side. This is an important point in differentiating riboflavin deficiency from chick encephalomalacia.

Symptoms of Riboflavin Deficiency in Chick Embryos.— Little abnormality can be noted in embryos dying before the tenth day of incubation. Embryos dying between the tenth and fourteenth day show markedly retarded growth and are sometimes oedematous.

As incubation proceeds various other defects appear. Lepkovsky⁽²⁴⁾ has described a degeneration of the embryonic Wolffian bodies, most frequently observed from the 17th to the 21st day. The Wolffian body may be normal in size and filled with a caseous material or swollen to several times its normal size and may be oedematous. Scarcity of down and failure of the down feather to rupture its surrounding sheath are not infrequent. The term "clubbed" down is applied to the later condition. Curling of the toes and embryonic anaemia have been described as symptoms.

Embryonic mortality seems to be highest in the first two weeks of incubation, but as the riboflavin level is increased the mortality shifts towards the later stages of incubation and finally to greatly improved hatchability. There are three peaks of mortality, *viz.*, 1st to 3rd day, 10th to 12th day, and 19th to 21st day.

Many of the chicks which hatch from eggs of hens on a partially deficient ration exhibit symptoms of curled toe paralysis exactly resembling those seen in growing chickens.

Lopkovsky *et al.*⁽²⁴⁾ noted a lesion of the beak of chicks hatched from the eggs produced by hens on a deficient ration. This occurred at the junction of the horny upper beak and the soft tissue. The lesion appears as a brown necrotic spot. They applied the term "notched" beak and indicated that there was a relationship between the riboflavin content of the hens' diet and the incidence of the occurrence of the lesion."

On *post-mortem* examination the chief prominent lesion noted was the hypertrophy and softening of the peripheral nerves, especially the sciatic nerves. Microscopic examination showed that the increase in size was principally due to swelling of the myelin substance.

The condition can be prevented by including some product rich in riboflavin. The best sources are milk and milk products, yeast, liver meal and fresh and dried green foods.

**THE INFLUENCE OF OÖPHORECTOMY ON THE PERFORMANCE
OF GREYHOUND BITCHES.** BY J. QUINLAN AND H. P. STEYN.

Onderstepoort Jnl. Vet. Sc. and An. Indus. VOL. 15, NOS. 1 AND 2.

Thirty-six greyhound bitches between the ages of six and twelve months have been oöphorectomised.

The oöphorectomised bitches have never shown the psychological or clinical symptoms of "heat".

Two oöphorectomised bitches have shown a tendency to slight increase in weight, 2-3 pounds, above that estimated as their best racing weights. Difficulty has been experienced in controlling the weight of these two bitches.

The performance of the oöphorectomised bitches has been comparable with that of their litter sisters.

Oöphorectomy appears to be a practical method of overcoming the difficulty experienced with greyhound bitches necessitating enforced rest from racing following each "heat" period.

Greyhound stud owners should consider the advisability of oöphorectomising all females not destined for stud purpose.

Extract

SMUGGLING OPIUM AND CHARAS IN THE STOMACHS OF

CAMELS. BY E. S. FARBROTHER, I.V. S., *Director of Veterinary Services, Bombay.*

In the *Excise supplement of the Bombay Police Gazette* of 1 August 1940 is published an interesting extract from the Annual Report for 1939 of the Central Narcotics Intelligence Bureau, Cairo, Egypt, on smuggling opium and charas into Egypt in the stomachs of camels.

About 30,000 to 35,000 camels are driven into Egypt annually from the East for the meat markets of the Nile valley. In October 1939, information was received at Rafa that certain persons were going to run narcotics through Sinai concealed in the stomachs of camels which were to be driven through, ostensibly for the meat markets. This information was at once

passed on to El Arish and Kantara where certain persons driving their camels across Sinai were arrested.

Some difficulty was experienced in determining which camels were carrying the narcotics owing to the large number of camels arriving at Kantara from the East at that time. However 'the Sinai Police are an exceptionally subtle body of men and can almost smell narcotics through a brick wall' and eventually nine camels were put under suspicion at Kantara and three others were soon in the lock-up at El Arish. One of the grounds of suspicion was that the owners refused £E 10 for a miserable camel not worth £E 3.

One of the camels detained at El Arish was slaughtered and in the rumen were found 27 containers with conical ends each 15 cm. long and 4 cm. in diameter. This information was conveyed to the *Mamour* of Kantara with instructions to slaughter the nine camels detained there while the two remaining camels at El Arish were also slaughtered and found to contain further narcotics. At Kantara, the nine camels had been released and were soon rounded up again and every one was found to carry narcotics in similar containers. From eighteen camels seized 17·770 kilos of hashish and 62·593 kilos of opium, worth about £E 2,200 in Egypt, were recovered.

It is pointed out that 'An interesting feature of this case is the strange ability of the camel to swallow 25 heavy containers or cylinders 15 × 4 cm. and weighing 250 gm. and to be able to travel and work with little or no inconvenience to himself.'

The camel is a ruminant and chews the cud; to prevent these containers being regurgitated they were weighed inside with a certain quantity of lead; they were also made too large to pass from the rumen or first stomach into the second and other stomachs. The rumen has at the sides a number of sacks in which the camel carries his water; it is in these sacks that the cylinders lodged up. According to the veterinary authorities the rumen possesses little or none of the digestive functions of the other stomachs and foreign objects such as these containers might lie there for weeks without upsetting the camel's digestion, especially when made of zinc and not tin. They are also carefully soldered up to prevent any action on the contained drugs from the heat or acids of the stomach. Presumably a camel so loaded would eventually lose condition and die, but in the present case the poor beast has served his purpose if he has managed to carry the tins for the six or seven days needed to travel from Khan Younis to West of Kantara.' The containers are forced down the camel's throat, presumably in the same way as a 'ball' is administered to a horse.

Since the number of animals that pass through the quarantine stations is so large and it will not be possible to rely on information in future, it is staged that steps are being taken to apply scientific methods for the detection of the containers and each station will have to be equipped with an X-Ray or other similar apparatus and a certain proportion of the camels submitted as a routine measure to 'its searching beam.'

An interesting case of the use of science in the perpetration of crime as well as in its detection!

'Indian Journal of Vety. Sc. & Ani. Husbandry', Vol. XI, Part II.

CONTROL OF HEMORRHAGE BY INTRAVENOUS USE OF OXALIC ACID. BY A. A. DAVIES, D.V.M., *Kansas City, Mo.*

Experimental work carried out at Kansas State College by Miller and Davies¹ indicates the value of oxalic acid given intravenously in the control of hemorrhage. Further work on animals suffering from internal hemorrhage caused by being hit by cars, as well as hemorrhage resulting from the removal of tumours, shows convincingly the value of oxalic acid in veterinary practice.

Steinberg and Brown reported their work with this agent at the meeting of the Federation of American Scientists for Experimental Biology, held at Toronto, Ont., April 29, 1939. They caused oxalic acid in 3-mg. doses in almost 1,000 human cases which were suffering from hemophilla, gastric ulcers, childbirth, and kidney and lung infections. In every case they reported that the hemorrhage had been stopped within five minutes.

Internal Hemorrhage

Twelve dogs hit by cars were treated as follows:—Six received oxalic acid in doses of one-half to 1 gr. (depending upon the weight of the animal) in 5 c.c. of water, while in the other six cases commercial coagulants were used. The latter six cases were in relatively good condition before treatment. The mucous membranes had considerable color. All of the cases in the first group, however, were in very poor condition. The mucous membranes were white, the pulse rapid and very weak, and the respirations rapid, shallow and gasping. In all cases treated with oxalic acid there was complete recovery within two days. Within one hour some of the color returned and the gasping and difficult breathing were relieved. At the end of eight hours the pulse and breathing had returned to normal. In five of the six dogs treated with commercial products death occurred from internal hemorrhage within a short time. The sixth animal recovered.

'Journal of A.V.M.A.,' October, 1939.

MILK—THE PERFECT FOOD. BUT EVERY INDIAN GETS ONLY SIX OUNCES A DAY.

We have received the following communication from Pandit Malaviya :—

The importance of milk as an article of human diet cannot be exaggerated. Thousands of years ago, the ancient sages of India noted the great nutrient value of milk, and the use of milk and butter was very widespread among the humble as well as the high in this country. During the last 50 years scientific investigation in the field of human nutrition has made clear the fundamental reasons why milk is an essential part of the diet under conditions of modern civilisation.

The Marketing Adviser to the Government of India, in his recent report on the marketing of milk says—

Milk is the most perfect single food known to mankind. It is a food ideal alike for the expectant mother, the infant, the growing child, the adult, and the aged. A seer of milk is equivalent in food value to nearly $\frac{1}{2}$ seer meat, nine eggs, 100 chattakas chicken or a seer of sole fish. Rich in first class proteins, milk is of special value to vegetarians. According to the best authorities on the subject of Vitamins, practically all Vitamins and especially Vitamins A, D and E are abundantly present in the milk of various animals, the latter being prominent in the case of milk of the cow. Presence of Vitamins in milk is responsible to a very great extent for making it an excellent health- tonic. With the present production of milk in India, however, the per capita consumption comes to only a little over 6 oz. per day. In other countries, people consume more than five times this quantity. In India, the poor do not get even 6 oz. and many of them have to go completely without milk or its products. Nevertheless, dairying is one of the most important cottage industries of the country and the value of the present production of milk is estimated at over Rs. 180 crores per annum.

As Lord Linlithgow observed in his speech when inaugurating the free-distribution of milk scheme of the Simla Municipality, "it is a scientific fact beyond dispute that a liberal supply of milk is an-essential constituent of diet for growing children, nor can there be the slightest doubt but that good nourishment in the early years of life is essential to the building up of a strong constitution in after life."

During the last few decades, many American and European countries have come to realise the importance of a liberal supply of milk as an essential article of human diet. In many countries, now-a-days, full meals or certain food stuffs, chiefly milk in various forms and milk products, are provided free or at a trivial cost. They are distributed to pregnant and nursing women, babies, children of pre-school age, school children, unemployed, indigent people, clinics and other institutions. The "Milk-in-Schools Scheme" has been in force in England since October 1934. It is open to all schools recognised by and receiving support from the Board of Education.

Avoid Flesh Food

To clear the ground it is necessary to draw attention to the opinion which has been expressed by various experts in the science of nutrition on the unsuitability of flesh food for man. Dr. Kellogg, the great American Physiologist, who has for over half a century advocated the use of non-meat diet, says: "There is nothing necessary or desirable for human nutrition to be found in meats or flesh foods which is not found in and derived from vegetable products." Flesh diet is specially unsuited to Indian climate and conditions. It has repeatedly been observed that non-vegetarian food, whether it be eggs, flesh or fish, is open to very serious hygienic objections, that it is positively harmful and leads to a multitude of diseases,

Obstacles in the Way

Attention has repeatedly been drawn in India during the last forty years to the milk problem. But it is deplorable that so little has been done to increase the production and consumption of milk in India. The situation has become much worse during the years that have passed and calls for immediate steps to improve it.

The chief causes which are responsible for the small production of milk may be summarised thus :

1. The slaughter of milch cattle ;
2. The paucity of good breeding bulls ;
3. The want of sufficient arrangements for the medical treatment of the cows ; and
4. Want of sufficient pasture land for grazing.

Regarding the question of pasture land, the ancient law-giver Manu enjoined, as an important item of village economy the provision of sufficient grazing land for every village. This beneficent practice was being followed in this country from the earliest times, but there has long been a complaint that the practice has been departed from and that the extent of the grazing land has not only not grown with the growing needs of the times, but has very much diminished. It is necessary, therefore, that the old system of reserving a part of the land of the village for pasturage should be revived or established with such modifications and under such conditions as the altered circumstances of the times demand.

One important result of it will be the establishment of dairy districts outside city limits which will save the cows from falling into the hands of the butcher for want of financial capacity on the part of the owner to maintain the cows when they are dry. And here I wish to draw attention to the report of the Expert Cattle Committee, which was appointed by the Government of Bombay and which reported in 1929. The Committee said : "The Committee is of the opinion that under the existing conditions whereby milch cattle are kept within city limits for milk production, legislation is necessary to prevent the slaughter of useful animals. They desire to emphasise, however, that if adequate arrangements could be made by Government, Municipalities, etc., for the establishment of dairy districts outside the cities where milk producers could produce milk, breed and rear milk stock and maintain dry animals until they come into milk again, the problem of the slaughter of useful animals would be very greatly minimised and might in time disappear altogether."

There should be no delay in giving effect to these recommendations if the Governments of the Provinces and other public bodies and agriculturists generally will recognise the far-reaching importance of the measures recommended.

"Hindu", 26-10-41.

Reviews

Administration Report of Mysore Civil Veterinary Department for 1938-39 :—There were 79 (75) veterinary hospitals and dispensaries at the end of the year. Generous donations from some philanthropic persons were received for the construction of the hospitals. 355888 (269221) fresh cases were admitted for treatment, 31081 (29762) castrations and 22438 (20478) surgical operations were done during the year. These figures indicate the growing popularity and their usefulness of these Veterinary Institutions. The scheme of maintaining good breeding bulls in the district head-quarters hospitals was revised during the year.

There were 325 (142) Rinderpest outbreaks. As usual the incidence and spread of this disease was reported to be mainly due to the transport of infected cattle from British Indian provinces into the state. The disease was however soon brought under control by the systematic inoculation campaign and enforcement of Mysore Cattle Diseases Act. The number of cattle protected was 101602 (51762). The total number of outbreaks of all other contagious diseases such as Black-Quarter, etc., was 7682. 173,037 (315,654) animals were protected against them.

Veterinary officers visited 15170 (14035) villages, treated 82802 (53472) cases, operated on 1792 (1290) cases, and castrated 52146 (38911) animals during the year. They also carried out propaganda work and attended 97 cattle fairs out of 99 held during the year.

The Government in their review regret to note that even in the two premier Municipalities of Bangalore and Mysore cities, meat inspection work has been entrusted to unqualified men and in some Municipalities no provision has been made at all for this inspection. The Government again piously reiterate the necessity to employ qualified men for this work and trust that all the concerned Municipalities will soon take action in the matter. Since so far their wishes and recommendations had no effect, we sincerely hope the Government would make it obligatory to employ only qualified men for the meat inspection work, without any further delay and waiting.

Systematic research work and investigation into the etiology of many diseases prevailing among cattle in the station, were continued during the year. Investigation into the cause of sterility and frequent cases of abortion in the Kunigal Stud and Hesserghatta Farms was also undertaken. The Imperial Council of Agricultural Research extended the scheme of investigation into John's disease in the state for two more years from July 1938.

The report contains as usual many interesting items of information and tables and is a record of yet another year's good work.

Annual Report of the Veterinary Department, Barwani State, C.I., for the year 1937-38 :—There was only one Veterinary Hospital and one touring Dispensary as in the previous year.

The staff consisted of a Veterinary Assistant Surgeon, a Salutry, a compounder, 2 vaccinators and a peon. The State Surgeon was the controlling authority. In the absence of permanent Veterinary Assistant surgeon on leave or otherwise the Salutry was in charge of the hospital as officiating Veterinary Assistant Surgeon.

The Veterinary Section continued to be a branch of the State Medical Department.

7933 cases were treated including 110 in-patients (in the hospital and on tour) as against 11773 in the previous year.

292 castrations and 289 surgical operations were performed as against 505 and 172 respectively in the previous year.

Reports received from the interior of the State were 48 (Rinderpest 38, Foot and Mouth 3, Black-quarter 2, Strangles 1 and other 4).

2509 animals were inoculated against Rinderpest and Anthrax during the year.

The Veterinary Assistant Surgeon was sent to the Punjab Veterinary College, Lahore, for training in the preparation and use of Goat tissue virus Caccine.

While on tour the Veterinary Assistant Surgeon delivered lectures to the rayat on Rinderpest, Foot and Mouth disease and castration.

Hand bills on Rinderpest, Foot and Mouth disease and castration were distributed to the rayat, patels, patwaries, Kamasdars, Revenue officer and other touring officers of the State who explain them to the rayat while on tour.

The staff and building were strengthened and the activities of the department extended to include the developments of the live stock industry in its several aspects in the State.

OBITUARY

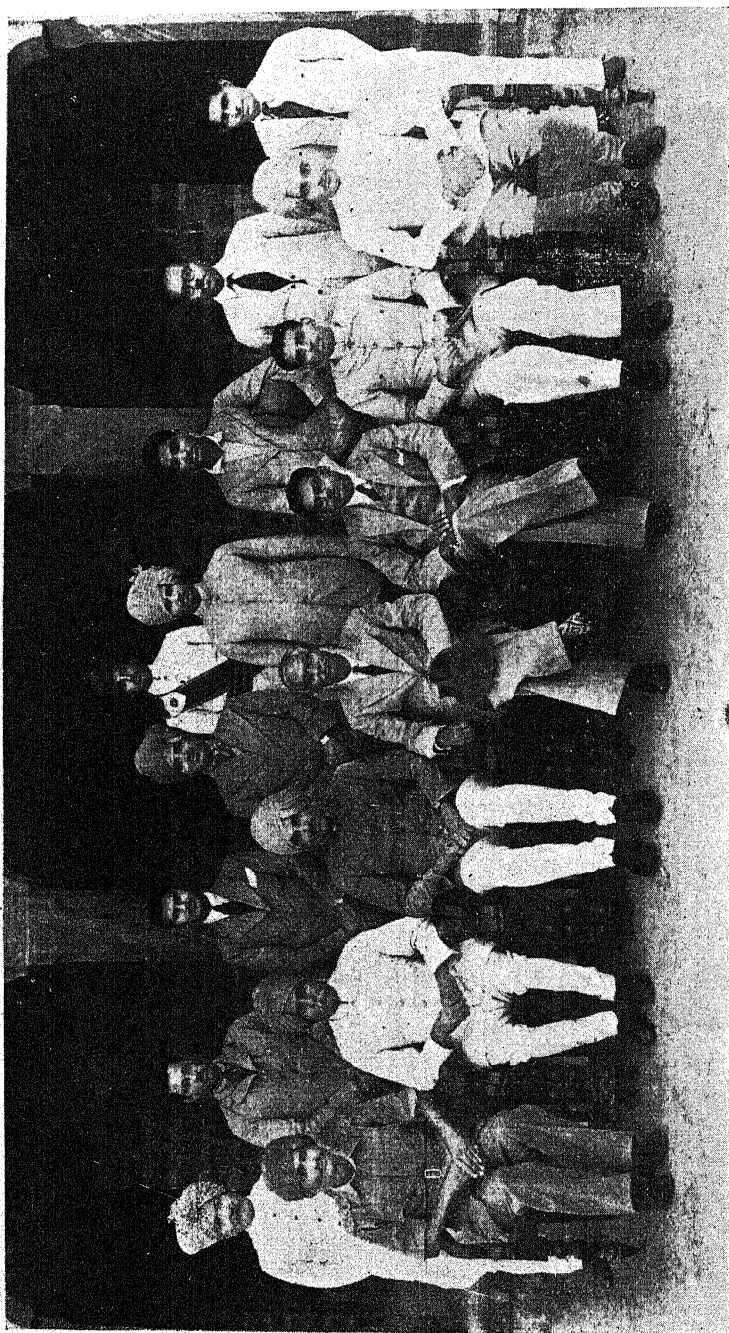
M. MOHAMMAD TAHIR MIRZA SAHIB, G.P.V.C.

We regret we have to record the demise of M. Mohammad Tahir Mirza Sahib, Retired Superintendent, Civil Veterinary Department, United Provinces, on August 27, 1941. He retired from service on September 16, 1938.

We tender our heartfelt condolences to the members of the bereaved family.



Late Mr. M. R. V. PANIKKAR, B. Sc. (Edin.), M.R.C.V.S.
Principl, Madras Veterinary College,
Who died on January 7, 1942.



Group Photo taken at the first Veterinary Conference of the Animal Husbandry Department, Government of Jodhpur, held at Jodhpur on September 1941, with Mr. B. B. JOSHI, G.B.V.C., the Director, seated in the centre.

Obituary

THE LATE MR. M. R. V. PANIKKAR

With profound regret we record the untimely death of Mr. M. R. V. Panikkar, Principal of the Madras Veterinary College on the 7th January 1942.

Mr. Panikkar had his early education in Trivandrum and Madura and proceeded to Great Britain in 1918 to qualify in Veterinary Science. After undergoing a course a of studies in the Royal (Dick) Veterinary College and the University of Edinburgh he returned to India early in 1924 with the degree of B.Sc. (Vety) and the Diploma of M. R. C. V. S. He is the first from Madras to have taken European Veterinary qualification.

Soon after his arrival in India, he was entertained as a Deputy Superintendent in the Civil Veterinary Department, Madras. After having worked for a short while in the districts, he was transferred to the teaching staff of the Madras Veterinary College. When the Principalship of the College fell vacant, he was appointed to the post about three years ago, which appointment he held till the time of his death. It may be mentioned that he was the first Indian to have acted as the Director of Veterinary Services of Madras.

A man of genial disposition and kindly manners, he endeared himself to one and all. As Principal of the Madras Veterinary College, he was dearly loved by his colleagues and students. He played a conspicuous part in the institution of the degree of B. V. Sc., in the Madras University.

It was only last year that he underwent a course of P. G. studies at Mukteswar. He served the Department for 17 years and was only 45 when he died.

He leaves behind his aged mother, wife and two young daughters and a host of friends to bemoan his death.

We offer our sincere and heartfelt condolences to the members of the bereaved family.

THE Indian Veterinary Journal

(The Journal of the All-India Veterinary Association)

Vol. XVIII

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No. 4

General Articles

ANTE-MORTEM INSPECTION OF TABLE POULTRY*

BY

T. G. HUNGERFORD, B.V.SC., H.D.A.,
Government Veterinary Officer, New South Wales.

* Reprinted from the *Australian Veterinary Journal*, Vol. XVII. No. 5, Oct, 1941.

Introduction

Although ante-mortem veterinary inspection of table poultry has attracted little interest in the past, more recently some attention has been paid to it in America, in Europe, and to a less extent in Great Britain (Blount, 1937; Young, 1937). It is to be regretted that in Australia the eating of poultry flesh is not as general as in other countries. The price of poultry flesh, pound for pound, is greater than that of other meats, and the public has come to consider poultry as a luxury or an invalid food. This attitude minimizes the demand, and the small demand in turn tends to preclude mass production with economic prices.

One possible factor which minimizes consumption by the public is the fear that birds slaughtered whilst in a diseased condition may be purchased. Unfortunately, there has been much justification for this fear, and it is felt that the institution of rigid veterinary inspection would do much to augment the consumption of poultry flesh.

* This article was written in January 1939. Since then (in July 1939) regulations have been framed under the Pure Foods Act, 1908, New South Wales, which control the conditions under which poultry shall be killed and dressed in that State. One condition (Paragraph 4 (d) of Section 78 (a) prescribes that "diseased poultry, whether alive or dead, shall not be suffered to remain on any premises used in connection with killing or dressing poultry for human consumption". No diseases of poultry, however, have been prescribed under the Pure Foods Act and it appears, therefore, that the term "diseased" is somewhat indefinite.

Mode of Inspection

In Sydney, the largest sale of poultry takes place bi-weekly at the Municipal Poultry Markets, where, during the peak period of the year, 300 turkeys, 3,000 ducks and 30,000 fowls may be sold each selling day.

These birds are placed in small pens, with up to about dozen birds in each. Owing to congestion and poor lighting of the premises, some of the pens may be in almost complete darkness. With due reference to the enormous speed and pressure of the commercial business where this great number of fowls is delivered, penned, recorded, sold and re-delivered within about four hours, veterinary inspection must be rapid and worked to a definite routine if it is to be effective.

As a general rule, the doors of the pens are not opened for individual examination of birds, excepting where some disease has been suspected as a result of the general examination.

A general examination is made by walking along the rows of pens and directing the light from a powerful electric torch on the heads of the birds. All healthy birds will lift their heads in curiosity to investigate the cause of the sudden light. It is important to have a powerful light, as birds in pens which happen to be well illuminated will not be attracted by a feeble torch gleam, and so many remain with their heads placed under the plumage of adjoining birds. After all heads have been raised, the torch light is directed around the legs of the birds to see whether any birds are still lying on the floor. If so, the front of the pen is tapped, when all healthy birds will jump up immediately. It can be assumed that if the head of each bird is seen and appears to be quite normal, with no gaping, gasping, coughing, nose or eye discharge or other abnormality, and that no birds are recumbent, then a closer inspection is unnecessary. After a little experience, it is surprising how few abnormalities are missed if such a general routine is adopted.

Diseased birds usually appear drowsy, huddled, will not raise their heads to investigate the torch light, or remain crouched on the ground, and further particularized investigations can then be made.

The Relationship of poultry diseases to human Health

Avian tuberculosis may, on rare occasions, be transmitted to human beings, and there are approximately forty cases recorded in scientific literature.

Salmonella typhi-murium infection in duck eggs has frequently caused outbreaks of food poisoning in Europe, and this infection in duck occurs in New South Wales.

Emmel (1936) has claimed that all types of leucosis are due to bacterial infections. Paratyphoid bacteria, and *Eberthella typhi* (the cause

of typhoid fever) were isolated from Chickens, and the author stated that there was some doubt as to whether food poisoning could not be caused by these agents.

McCaughey (1932) recorded six cases of disease in poultry caused by organisms of the paradysentery group, and five instances of infection with *Salmonella* other than *S. pullorum* or *S. gallinarum*. He states that these infections are of interest to veterinarians, because they cannot be differentiated clinically from pullorum disease of fowl typhoid, and because the origin of infection in certain cases of food poisoning has been traced to infected birds or eggs.

In general, however, it would appear that diseases in poultry slaughtered for table purposes are unlikely to be transmitted to human beings. However, all abnormalities in table poultry carcasses, such as conditions accompanied by emaciation and manifest disease lesions, should cause their rejection on æsthetic grounds, and also from the standpoint of palatability and keeping qualities.

With the above considerations in mind, a veterinarian acting in the capacity of an inspector at the table poultry markets would be inclined to reject any diseased birds. In this State, under the Stock Diseases Act, certain poultry diseases are scheduled, and when a bird is affected with one of these diseases it may be destroyed on the written authority of the Chief Veterinary Surgeon. In conditions which do not come under the provisions of such legislation, the Veterinary Inspector, if also an Inspector under the Cruelty to Animals Act, may authorize the destruction of the affected birds for humane reasons, and in the small proportion of affected birds which come under neither of these categories, it is usually necessary to bring diplomatic pressure to bear upon the agents to whom the birds have been consigned. Such persons are usually quite willing to co-operate in the elimination of diseased poultry, as their presence tends to undermine the confidence of the consuming public.

Diseases Encountered

FOWLS

In this State, the diseases listed below are of common occurrence and they are cited in order of the relative frequency with which they are encountered.

Catarrhal Diseases (referred to popularly as "Roup Diseases"). This disease group comprises coryza (most commonly seen), infectious catarrh*, infectious laryngo-tracheitis*, fowl pox and hypovitaminosis A. It is common to find large consignments of perhaps 400 or 500 birds showing symptoms of one of these diseases. When an outbreak of laryngo-tracheitis occurs, the owner may destroy the most severely affected birds and forward the rest of his stock to market promptly. Many of these birds

*Scheduled under the Stock Diseases Act, 1923-24, of New South Wales.

may develop clinical symptoms of the disease, which may be accentuated by the journey, crowding together in a crate, and subsequent rough handling which is inevitably meted out to birds in their transport from cartage crates to market pens. Birds affected with acute laryngo-tracheitis or infectious catarrh may have fevered carcasses. In the chronic forms of these two diseases, and in the diphtheritic form of fowl pox and also hypovitaminosis A, there may be extensive formation of diphtheritic membranes in the nasal, mouth and throat cavities. Such carcasses may also be fevered.

In coryza, the birds cough constantly, sneeze, and show a discharge from the nose and eyes. It is considered that all birds which exhibit these symptoms are not fit for human consumption, on æsthetic grounds at least.

It is noteworthy that when poultry are sent long distances, crowded together in small coops, quite healthy birds may develop a thin mucoid nasal secretion, together with a certain amount of "gaping". This condition can be readily differentiated from the thicker mucous secretions and inflammatory condition of the eyes seen in coryza and other catarrhal diseases.

Paralysis. As a common practice, many poultry farmers send all paralysed birds to market. These may be affected with one of the many types of leucosis (including *neurolymphomatosis gallinarum*), or, on the other hand, the paralysis may be due to severe tapeworm infestation, neoplastic conditions, or injury. There is usually little difficulty in arranging with the agents concerned for the destruction of such birds.

Diarrhæa. This is frequently seen and may be due to worm infestation, coccidiosis, enterohepatitis, some systemic disease such as laryngo-tracheitis or septicæmic *Salmonella pullorum* infection, or to a specified bacterial enteritis.

Cloacitis (or "Vent Gleet") is very common, and is usually associated with a particularly foul smell which may taint the whole carcass.

*Coccidiosis and Enterohepatitis** are very common in young table poultry.

Emaciation. Emaciated birds are seen in great numbers, as poultry farmers constantly cull these birds from their flocks and, rather than destroy them, make a habit of forwarding them to the market in the hope of obtaining a few pence. This practice tends to decrease the consumption of table poultry. The birds may be affected with one of the forms of leucosis, heavy parasitic infestation, or may be the subjects of bullying by their fellows. In the absence of legislation prescribing that table poultry must be free from certain diseases, it may be somewhat difficult to deal with these birds, but it is usually possible to arrange their destruction with the agents.

*Avian tuberculosis was detected in the Southern portion of New South Wales in 1940.

Neoplastic conditions are common in poultry.

"*Water bag*". This is a condition in which the abdomen is markedly distended and is carried "penguin fashion" with the vent close to or touching the ground. It is due to a variety of causes, most frequent of which are large ovarian cysts filled with serous fluid, ascitis, or accumulation of large masses of egg yolk following abnormality of the fimbriated end of the Fallopian tube, or rupture of the lower portion of the oviduct. Affected birds are not suitable for human consumption.

"*Bumble Foot*". This is a condition of local necrosis associated with cellulitis of the foot, and sometimes of the leg structures. Severely affected birds may be fevered.

Septicæmic Infections with Salmonella Pullorum". Cases are not rare, and hens of heavy breed may be seen showing symptoms of fever, diarrhœa and malaise.

Anæmia. Anæmic birds are common, and may be affected with leucosis; or the anaemia may be the result of extensive red mite, fowl tick or external parasitic infestations.

Hypertrophic Osteitis. This is a name used to designate the condition in which the shank bones, tibiae and sometimes bones of the body are markedly enlarged, though retaining their normal firmness. The term osteitis may be a misnomer, as there is no apparent inflammation; it is possible that this is one sign of a type of leucosis. Odd cases occur sporadically on many farms, and the birds are almost invariably forwarded to market. In the past no action has been taken concerning them.

*Spirochaetosis**. Cases of this disease occasionally are forwarded from the western districts of this State, and they show a yellowish or greenish diarrhoea, and not infrequently cyanosis in chronic infections.

*Fowl Cholera**. Cases of œdema of the wattles are usually localized cholera infections. These are not uncommon. Odd cases of the septicæmic form of cholera which show yellowish diarrhœa may be forwarded, when the carcasses are usually fevered.

Bruises, Injuries and Fractures. These are extremely common due to the not infrequent habit of attendants flinging birds violently from one to another; for example, the bird may be unloaded from a crate which is still on a lorry and flung ten feet to an attendant who is placing the birds in the market pen. An effort on the bird's part to check its impetus with the wings may deviate the direction of the throw, and the impact with the side of the pen may cause a serious bruise or fracture. These cases can be dealt with under the provisions of the Prevention of Cruelty to Animals Act.

It is to be noted that tuberculosis has not been encountered in this State as yet*, and is not a cause of emaciation here.

TURKEYS.

Sinusitis. This is most commonly encountered, and on general principles it is undesirable that birds affected with the acute form should be passed as fit for human consumption.

Enterohepatitis.—Odd birds affected with the chronic form of this condition may find their way into the markets. They show evidence of cyanosis, malaise and diarrhoea, and should be destroyed, if possible, by arrangement with the agents.

Fowl Pox is common, but not of much significance,

Crooked Breasts.—It is claimed by some that a pre-disposition to this abnormality is inherited, the distortion being induced by a deficiency of calcium or phosphorus, or by imbalance of these elements. Early perching and unsuitable perches are also contributory factors. Crooked breast causes a marked depreciation of the value of the bird for table purposes.

DUCKS.

Affections leading to condemnation have not been commonly observed in ducks. Birds are often found suffering acutely from thirst, having been forwarded to market without water and kept for perhaps twenty-four hours or longer in this condition. Water may then be made available, and not infrequently fatalities occur.

Infections with *Salmonella typhi-murium* occurs in ducks in this State, and in one particular district the owner forwarded all birds in contact and in the incubation stage of the disease to the poultry markets. As is well known, if such carcasses are consumed without being well cooked, serious enteric disease may be set up in humans. Thus, in cases where ducks are dying in the market, careful post-mortem examinations should be made. Where enteric lesions, and lesions of the liver and spleen are found, bacteriological confirmation should be sought before further sales are permitted.

Significance of Poultry Market Inspections

Apart from the prevention of entry of diseased carcasses into consumption, an important aspect from the disease control point of view is making contact with disease outbreaks, so that the matter may be taken up with the owner on his farm, and suitable advice given concerning prophylactic measures, control and treatment.

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THE SEVENTH ANNUAL CATTLE SHOW

AND

THE-STONE DRAGGING COMPETITION AT MAHANANDI, KURNOOL DISTRICT.

BY

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Mahanandi is a sacred pilgrim centre in Kurnool District on the borders of Nallamalais and is a beautiful spot where nature smiles eternally and attracts many a visitor. Here exists the temple of Sree Mahanandiswara (Lord Siva) and His Sacred Bull (Maha-Nandi). The temple was neglected for a long time but during the period of the present trustee, Sri B. Mahanandiah, it has been considerably improved. In order to create a healthy spirit of competition among the cattle owners of the tract, a Cattle Show and a Stone-Dragging Competition are held annually at the temple during the Mahasivaratri festival.

The temple has become famous more due to the perennial spring the origin of which is not known but which emerges out of the mouth of an Idol of Sacred Bull kept in situ before the temple. This spring flows into a small tank and then led out of the temple premises, through channels to irrigate the adjacent gardens. The water of the spring is crystal clear and will always be warm. A bath in the tank is very refreshing and is very much enjoyed by all the visitors.

The temple premises are surrounded by the reserve forest and there will be very few persons here throughout the year. During the Mahasivaratri festival, however, the spot will be full of pilgrims and will have the appearance of a busy town. Such is the spot in which the Cattle Show is held every year. Besides the propaganda value of the place as a pilgrim centre, the presence of the famous Bull Temple here justifies the holding of the Cattle Show and reminds one about our livestock and its improvement. The Stone-Dragging Competition held every year is also a significant feature of the festival.

This year, the Cattle Show was held on the 24th and 25th of February 1941. It is gratifying to note that this year's show was opened by the Director of Veterinary Services, Madras. Another interesting feature of the show was the exhibition of some good bulls born and brought up in this district. In previous years, only bulls purchased from other districts and reared in these parts were brought to the exhibition.

As usual, the Civil Veterinary Department, Madras, took an active part in the show and opened an Exhibition Stall and Camp Dispensary on the occasion and conducted Magic Lantern lectures and demonstration of castration by Burdizzo's method. The Touring Veterinary Assistant Surgeon, Panyam was in charge of the show and was assisted by the Special Veterinary Assistant Surgeon, Nandyal.

Cattle were admitted to the show from the morning of the 24th and the number of entries to all the sections was 62. Out of these, there were 41 bulls, 4 bullocks, 9 cows and 8 young stock which were born and brought up in this district. This shows that the importance of local breeding is slowly being realised by the ryots and it is hoped that number will increase next year.

The Director of Veterinary Services, Madras, visited Mahanandi on 24th evening. In his opening speech he dealt with the improvement of livestock and impressed upon the minds of the audience about the systematic lines on which the improvement is to be effected.

The cattle were arranged for the Show, according to their age (teeth) and class and the judging was done on the evening of 25th. The District Veterinary Officer, Bellary, was the chief judge for the show. 32 prizes were awarded to the best cattle, the total amount spent being Rs. 161 and almost all the first prizes were given in the shape of improved ploughs which will be useful to the ryots. This was much appreciated by the public as well as by the owners of the exhibits. The funds for the Show were raised partly by subscriptions from the public and partly by grants from Government and District Board. The Civil Veterinary Department gave a grant of Rs. 50 as usual.

The prizes were given away on the 25th evening by the President of the show and the District Veterinary Officer, Bellary, addressed the conference on the improvement of livestock in a very interesting speech.

The Stone-Dragging Contest

The annual Stone-Dragging contest was held this year on the morning of 25th February 1931. The stone is of granite measuring $11' \times 2'3'' \times 2'3''$ and weighs about $3\frac{1}{2}$ tons. The pair of bulls that drags the stone to the maximum distance on the road over which it lies, will get the gold medal (valued about Rs. 30). This medal is offered by the Trustee of the temple every year.

Two pairs of bulls competed this year for the contest. The pair belonging to Sri K. Chelamareddy of Karivena, Nandikotkur Taluk, Kurnool District, dragged the stone for a record distance of 239 ft.-8 in. beating the

previous record of 211 ft. 5 in. dragged in 1938-39. The other pair of bulls dragged the stone for a distance of 89 ft. 1 in. The time fixed for the contest was 30 minutes and the owners were not allowed to handle the bulls harshly.

The gold medal for the year was presented to the owner of the winning pair, Sri K. Chelama Reddy on 26-2-41 at the time of Rathothsavam (Car festival).

This sort of stone-dragging contest is in vogue throughout the district and is practised in connection with every important festival in many villages and gives good impetus to the ryots to feed their bulls well. If in addition to this, the ryots will only take to cattle breeding also, the district will become self sufficient for the livestock and the ryots will become more prosperous by saving about 10 lakhs of rupees that go out of the district for purchase of working bulls every year. The Civil Veterinary Department Madras is doing its best to bring this point home to the ryots and as a result of it there are now signs that within a few years the ideal may be achieved. Let us hope for the best and do our duty towards the dumb animals and the ryots.

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A NOTE ON VARIATIONS IN THE EFFICIENCY OF THE
COPPER SULPHATE AND NICOTINE SULPHATE
DRENCH AGAINST *HÆMONCHUS CONTORTUS*.*

BY

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Introduction.

The mixture of copper sulphate with nicotine sulphate has been used for anthelmintic treatment of sheep for many years. Since 1935 it has been widely used in Australia against *Trichostrongylus* spp. and *Haemonchus contortus* with satisfactory results for the most part. It is recognized, however, that the mixture is not highly efficient against *Trichostrongylus* spp. On numerous occasions at the laboratory and in the field copper sulphate alone has been found not to be efficient against *Trichostrongylus* spp. If nicotine sulphate be injected or swallowed into the rumen it does not exert an anthelmintic effect against *H. contortus*; but if it be swallowed or injected into the abomasum it is highly effective in killing this species. It is, therefore, apparent that nicotine sulphate is only effective when it enters the abomasum in adequate concentration and that, in general, its efficiency in the field will depend on whether the copper sulphate with which it is mixed brings about reflex closure of the oesophageal groove.

In numerous experiments carried out on sheep at the McMaster Laboratory by Clunies Ross (1934) and Gordon (unpublished) the effects of the administration of copper sulphate solution by mouth on the oesophageal groove reflex have been observed. In 184 out of 209 sheep (88 per cent.) fluids passed directly to the abomasum when administered with, or immediately after, a drench of copper sulphate solution. In the remaining 12 per cent. of animals the fluids passed into the other compartments. In different groups of experimental animals the proportion in which the fluids passed directly to the abomasum ranged from 70 to 100 per cent.

Thus, if the efficiency of a drench depends upon copper sulphate conveying it direct to the abomasum, it may be unsuccessful in as many

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as 30 *per cent.* of sheep, simply because reflex closure of the œsophageal groove has not occurred. The average failure from this cause, however, should not be greater than about 12 *per cent.*

Watson (1941) found that the course taken by liquid administered into the mouth shortly after copper sulphate solution differed with individual sheep. In most sheep it passes, on almost all occasions, completely or largely to the abomasum, but in some sheep the fluid passes to the rumen or the abomasum, or both, quite irregularly.

It was thought that failure of the œsophageal groove reflex to respond to stimulation by copper sulphate occurred by chance, and that a sheep which failed to respond on one occasion would respond at a subsequent treatment. Recently, however, it has been found that the individual sheep may repeatedly fail to respond to treatment in which copper sulphate is administered concurrently with other drugs. In such individuals the œsophageal groove reflex may be quite unresponsive to copper sulphate, or its response to stimulation by this drug may merely be delayed. If the response is delayed, the anthelmintic drug may be conveyed to the abomasum in a greater proportion of cases when copper sulphate solution is administered some time, possibly even some seconds beforehand. Quin and Van der Wath (1938) found that in some sheep (the proportion of cases is not given) copper sulphate does not bring about an immediate increase in ruminal movements, and that three or four minutes may elapse before response to reflex stimulation is manifested. In the majority of sheep, however, ruminal movements increased immediately after administration of copper sulphate. There appeared to be a close association between the œsophageal groove reflex and stimulation of ruminal movements, and it was found that individuals which showed no immediate response to copper sulphate on one occasion behaved similarly on subsequent occasions. In a private communication Watson states that two of his experimental sheep failed to respond to copper sulphate on five consecutive occasions over a period of one month. These findings are supported by the observations here recorded.

Observation 1.

Some adult Border Leicester ewes were treated with copper sulphate-nicotine sulphate mixture at regular intervals of from three to four weeks throughout the greater part of 1939. At each treatment faecal samples were collected from about 15 *per cent.* of the ewes, selected at random, for egg counts and faecal cultures. At almost every examination a few sheep showed moderate to heavy infestations with *Haemonchus contortus*. It was thought that these were cases in which copper sulphate had failed to bring about reflex closure of the œsophageal groove at the previous treatment and that subsequent treatment would probably be successful. In fact, however, the random examination of faecal samples had prevented our

realising that certain individuals were repeatedly failing to respond to treatment. This only became clear when egg counts were carried out on all sheep in the flock. Drought prevailed for some months before the flock egg counts were carried out, and it was extremely unlikely that the sheep had acquired reinfestation since the last treatment.

When egg counts were carried out on the 72 sheep in this flock, on several occasions it was found that 40 of them (55·5 *per cent.*) were infested with *H. contortus* to a degree which indicated that the preceding treatments had failed. From these 40 sheep, two groups were selected. One group was treated with the dose of copper sulphate-nicotine sulphate mixture previously used for routine drenching (30 ml. of 4 *per cent.* solution) and the other with 2 ml. carbon tetrachloride in 3 ml. liquid paraffin. Carbon tetrachloride is effective against *H. contortus* in the majority of sheep even when swallowed into the rumen.

Following treatment, egg counts were carried out on several occasions and showed that the copper sulphate-nicotine sulphate mixture was effective (reducing the number of *H. contortus* eggs per gramme of faeces by 70 *per cent.* or more) in 5 of the 17 sheep (29 *per cent.*) and was quite ineffective in the remaining 12 (71 *per cent.*). Carbon tetrachloride was effective in 18 of the 23 sheep so treated (78 *per cent.*) and reduced the egg counts by from 50 to 69 *per cent.* in the remaining 5 sheep.

Eleven of the sheep which had failed to respond to the copper sulphate-nicotine sulphate mixture were re-treated about three weeks later and eight (72 *per cent.*) again showed no reduction in egg count. On treating these eight sheep subsequently with carbon tetrachloride a high degree of efficiency was recorded in all cases.

Observation 2

The sheep in the trial from which the following data were obtained formed portion of an "epidemiology" flock running under natural pasture conditions near Armidale, N. S. W. They were from 6 to 12 months old. Egg counts and cultures of faecal samples were carried out weekly and as far as possible, anthelmintic treatment was avoided. The object of the trial was to seek a correlation between the occurrence and progress of outbreaks of helminthiasis and weather conditions. Owing to the development of severe infestations and the difficulties of replacing sheep which died with comparable animals whose past histories regarding fluctuations in worm burden were known, it was necessary to adopt treatment on a number of occasions. Treatments were irregular and some sheep were re-treated several times. In all, 33 sheep received a total of 60 treatments of which 27, or 45 *per cent.*, were unsuccessful. The unsuccessful treatments were mainly attributable to 8 sheep, in 5 of which treatment failed on each of two occasions, and in the other 3 on each of three occasions.

Observation 3

The following data were obtained from a field trial conducted near Armidale, N.S.W. The 21 sheep in the trial were about 16 months old and were treated every three weeks with copper sulphate-nicotine sulphate mixture. Egg counts and cultures were made on faecal samples collected on the day of treatment and again one week after. Treatment was considered successful if the number of *H. contortus* eggs per gramme of faeces was reduced by 70 *per cent.* or more. The records summarized in Table I were collected over a period of twelve months.

TABLE I

Effects of Repeated Treatments of Individual Sheep with Copper Sulphate-Nicotine Sulphate Mixture against Haemonchus contortus.

Treatment.	Number of sheep in group infected with <i>Haemonchus contortus</i> .	Number of sheep in which treatment failed	Ear Tag Numbers of sheep in which treatment failed.
1	12	3	1, 9, 10
2	18	6	1, 3, 4, 9, 11, 12
3	17	7	1, 3, 4, 9, 10, 11, 12
4	15	3	3, 7, 11
5	19	3	3, 8, 9
6	12	3	1, 3, 10
7	1	1	10
8	3	2	9, 10
9	16	2	3, 10
10	4	1	9
11	13	3	3, 8, 13
12	3	1	10
13	19	8	1, 3, 9, 10, 11, 13, 14, 15
14	4	2	10, 11
15	16	4	1, 3, 9, 10
16	16	4	1, 3, 9, 10
17	14	2	3, 10
18	15	2	3, 10
	217	57	12 Sheep (Nos. 1, 3, 4, 7, 8, 9, 10, 11, 12, 13, 14, 15)

Of 217 treatments of sheep infested with *H. contortus*, 57 or 26 *per cent.* were unsuccessful. Twelve sheep out of a total of 21 in the group contributed to these failures, and five sheep (Nos. 1, 3, 9, 10 and 11) accounted for nearly all of them (46 out of 57). Hence, among a group of

21 sheep there were 5, or approximately 25 *per cent.*, which persistently failed to respond to treatment with copper sulphate-nicotine sulphate mixture. If this applies in average flocks it is a very serious matter in view of the continual heavy contamination of the pastures which would result despite regular treatment of the whole flock with this mixture.

Discussion

In addition to these observations there have been a number of occasions in the field in which the evidence was highly suggestive of a similar happening. The usual history has been that in outbreaks of haemonchosis among adult sheep repeated treatments with copper sulphate, either alone or mixed with nicotine sulphate, has left a number of heavily infested sheep which, however, recovered after treatment with carbon tetrachloride.

The observations summarised above indicate that there is a porportion of sheep in which copper sulphate repeatedly fails to pass directly into the abomasum. Whether this is due to delay in reflex closure of the oesophageal groove (see Quin and van der Wath, 1938), or a complete absence of response to the stimulus of copper sulphate, was not determined. Watson (1941) states that the response may not occur for some seconds after the delivery of copper sulphate into the mouth, but that the delay is not more than eight seconds in most instances.

The practical significance of these findings is considerable. They stress the importance, in outbreaks of haemonchosis, of using carbon tetrachloride for any individuals which fail to respond to treatment with copper sulphate or copper sulphate-nicotine sulphate mixture. Although no tests have been made, it is improbable that such animals would respond to copper sulphate, sodium arsenite mixture. Unless they are given effective treatment, such individuals are likely to succumb. If they survive they will continue to contaminate the pastures with eggs and so prolong the outbreak.

Conclusions

1. Individual sheep may repeatedly fail to respond to treatment with copper sulphate-nicotine sulphate mixture against *H. contortus*.
2. This observation explains those instances in which outbreaks of haemonchosis are not satisfactorily controlled by repeated drenching with this mixture.
3. The reason for these repeated failures is not clear, but it is assumed to be the failure of closure of the oesophageal groove in certain individuals.
4. Cases of haemonchosis which do not respond to copper sulphate-nicotine sulphate mixture can be successfully treated with carbon tetrachloride.

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Editorial

THE NEW YEAR

The year 1941 has been rung out and the year 1942 has been rung in. Ordinarily, when peace is reigning in the lands, the passing away of the Old Year and the ushering of the New Year is a period of carols and carnivals all over the world. But, now, times are extraordinary. There is no peace in many a land. A devastating World War is going on. People are flying at each other's throats and wholesale annihilation of men, women and children are taking place. Vast fertile tracts are made desolate in as short a time as possible. Towns and Cities are ruined overnight and left burning. Science is being prostituted for forging weapons of destruction. This cataclysm which had engulfed the European continent for over two years has, now, with the entry of Japan into the War, spread to the Eastern Hemisphere also. India, which had so far been spared the horrors of this World War is now practically in it. This is necessarily bound to cause a certain amount of suffering to the people in the country. The members of the Veterinary Profession also will not be exempt from this and we are sure that, from an economic stand point, which is already low in their case, they will feel their position much more keenly. But, all the same, there should not be any ground for despondency or gloom. This World War cannot possibly go on for long. Right must triumph over Wrong.

We should, therefore, steel our hearts and look forward to the year 1942 with calmness and courage, firm in the justice of our cause, and firmer still in the belief that Truth must win.

VETERINARY PUBLIC HEALTH IN MUNICIPALITIES

II

The Menace of Rabid Dogs

Closely intimately connected with the Public Health, or rather Life itself, is the problem of Rabies in Dogs in this country. The deplorable position now generally existing in this country with regard to rabies is well illustrated in one of the popular articles in the *Agriculture and Live-Stock in India*.^{*} Figures collected from the various parts of the country reveal that the number of persons bitten by dogs—rabid or suspected to be rabid—lies in the neighbourhood of 20,000 per annum. This figure does not include the many unreported cases. Statistics of the Pasteur Institutes in the country prove that there has been generally an increase every year in the number of persons taking anti-rabic treatment and also a steady decrease in the number of deaths among those treated. But for the effective anti-rabic treatment given by the Pasteur Institutes, the annual toll of human life claimed by rabies would have been amazingly heavy. With regard to the number of animals exposed to such danger, no accurate or even approximate information seems to be available because of the defective recording and reporting. But our readers are quite aware that generally the number of animals exposed to this infection is greater than that of human beings, whenever there is an occurrence of rabies among dogs in a locality. Many of the animals thus exposed to infection go without getting the benefit of anti-rabic treatment because of the cost of the treatment, which the owner—rich or poor—has to bear, the low value of the animals and the poor economic condition of

^{*} 'The Menace of Rabid Dogs in India' by M. Y. Mangrulkar, M.Sc., M.R.C.V.S., D.T.V.M. (Edin.), in *Agriculture and Live-stock in India*, in vol. IX, Part VI, November 1939.

the owners themselves. These factors are also responsible for the scanty statistical information available about the infected animals. The untreated animals—especially dogs—are also a source of further danger when they develop rabies.

This or any other disease communicable from animals to men can never be exterminated from the country by the mere treatment of patients. On the other hand, an effective treatment immediately after an exposure but before the development of symptoms as in rabies, will only help the continuance of the malady in the country because of the very efficacy of the post-infection treatment. Attention should therefore be directed towards the prevention of the very *occurrence* of rabies and not merely towards the prevention of its *spread*.

The Police, Medical and Veterinary Departments in this country have not been invested with the powers necessary to control, prevent or combat the menace of rabies. The procedure generally adopted now in regard to this disease is the detention of the suspected dog for observation and the treatment of the bitten and in-contact animals and persons. Although this procedure is in itself an important step in the control of rabies after its occurrence, we may restate here that the ideal to be achieved should be the prevention of the very *occurrence* itself rather than of its *spread*. In connection with its control, it is necessary to bear in mind that most of the cases in men and animals occur from bites from rabid dogs. Dog is, therefore, the greatest source of danger and the mongrel dogs, unfortunately so abundant in this country, are largely, if not solely, responsible for the spread of this disease. It is therefore evident that the eradication of the disease from the country can be successfully carried out only when a successful drive is directed towards the extinction of the ownerless and stray dogs. There is no legal provision at present against the existence of such dogs, though spasmodic attempts are made against their existence in cities and towns under the orders of the local authorities. Complete extermination of these ownerless dogs should therefore be enforced. This rather drastic suggestion

will be welcomed when once it is realised that this is the most effective measure for the eradication of the disease. In other countries, rigid enforcement of stringent laws has proved that it is possible not only to reduce considerably the incidence of rabies but also to make it a thing of the past. To obtain similar results here, granting licences to owners, registration of dogs compulsory muzzling of them, when taken out for exercise, and control over the importation of dogs are some of the important measures necessary to be legally enforced, in addition to the extermination of the stray and ownerless dogs.

Conscientious propaganda to reach the dwellers in towns and villages should be conducted by means of lantern and other lectures, display of illustrated posters and distribution of leaflets in the country. Educating the public opinion along proper lines is an absolute necessity to overcome superstition and conservatism and to produce surprisingly good results in this respect as in so many others. This educative propaganda can be best undertaken on a wide scale by the members of the Veterinary Profession in service, in private practice and on pension. But it is up to the heads of the Veterinary Departments in the Provinces and States to mobilise these forces and organise a regular and effective propaganda and campaign under the name of "Anti-rabic League," in co-operation with the Medical and Public Health Departments, to educate the public opinion and to bring about necessary legislative measure against the menace of rabies. In this connection, it is necessary to remember that even the most stringent laws and their rigorous enforcement in a particular Province or State will fail to produce the desired results if the neighbouring Provinces and States fail to enforce similar measures within them. The Central Government should, therefore, use its own influence on all the Provinces and States towards a combined drive against rabies.

AN APPEAL

We draw the attention of our readers to an appeal issued by Mr. M. Velu Pillai to his colleagues in the State of Travancore, published elsewhere in this issue. Mr. Velu Pillai has just returned — we think in time — from Malayan Peninsula after a long period of service there. He has a burning desire to see the Veterinary Profession taking its legitimate share in advancing the economic prosperity of the country and we dare say the members of the Profession in Travancore will co-operate to the full in achieving this object.

We take this opportunity of once again appealing to the Veterinary Surgeons — in service or in retirement — all over India to shake off their apathy and infuse life and energy to the various Veterinary Associations in the country. A good number of them are not — we deeply regret to say — functioning satisfactorily and nothing is heard of their activities. When it is remembered that the formation of these Associations was heralded with great pomp and pageantry, that they all functioned very well for some time, with credit and advantage to the profession, the present moribund state is not only inexplicable but extremely painful and tragic. It is true the scandalously low pay and poor prospects offered by the Government — an unjustifiable treatment adopted — sits like an incubus on the enthusiasm of the members but the method of remedying that defect is not by sitting quiet and moaning over it. It is only by repeated pleadings and representations they can be remedied.

We therefore implore the members especially the senior members of the profession to give a lead to the younger generation by reviving the slumbering organisations and making them function as of old.

Clinical Articles

RUPTURE OF BLADDER IN A BULL CALF

BY

V. V. VENKATACHALA IYER, G.M.V.C.,

AND

A. V. HARIHARAN, G.M.V.C.,

Veterinary Assistant Surgeons, Madura.

A bull calf about 5 months old was admitted into this dispensary on 28-7-41 with the following history :— No micturition for the previous five days, not suckling the mother, but only occasionally taking a little cold water, bowels costive and dung mucus coated.

On examination, the patient was found to be uneasy and restless, occasionally kicking at the abdomen and straining to urinate but with no result. Visible mucous membranes slightly congested, abdomen dropsical and pendulous, temperature 102° F.

A provisional diagnosis of rupture of bladder with escape of urine into peritoneal cavity was made. With the consent of the owner, an operation was decided upon. The posterior bowels were cleaned by an enema and the calf was given intravenously a dose of chloral hydras 30 grains in 25 c.c. of water and placed on the table.

Operation :— With the usual antiseptic precautions an incision 8 inches long was made parallel to the linea alba avoiding the penis and sheath, posterior to the umbilicus. The subcutaneous fascia was separated and the abdominal muscles gently dissected avoiding the blood vessels. Peritoneum was opened and secured on either side with ligatures. About 8 pints of urine were removed from the peritoneal cavity.

The bladder was found distended with urine. It was gently brought out and a tiny rupture about 1/12th of an inch in diameter was noticed on its wall inferiorly. The rupture was extended by a longitudinal incision of about 3 inches and the interior of the bladder was exposed. It was found to contain small gritty calcareous deposits more particularly collected at the cervix. It was also congested in patches and ecchymosis was visible in different places.

The bladder was irrigated with $\frac{1}{2}$ per cent of acriflavine solution, cleaned and sponged thoroughly. Then its walls were sutured by Lembert's sutures with catgut and the organ replaced in the abdominal cavity.

The peritoneal cavity was completely drained of all urine and sponged. The peritoneum, muscle and skin were separately sutured. The wound was dressed with Tr. Benzoin Co. and bandaged.

The calf was conscious all the time and lying quietly.

When the effects of the Chloral Hydras wore off, the calf was given barley congee, glucose and plain water alone.

Next day, 29th July 1941, temperature 103° F. The animal was dull but took congee etc. Urine, though slightly coloured, was passed through the normal passage. Hexamine 30 grains in 2 ounces of water was given by the mouth and also an enema.

30th July 1941: Temperature 104° F, animal still dull but took liquid food. Urine still coloured. Examination of sediment of urine revealed Streptococci, in large numbers. Dung hard. 2 tablets of Sulphanilamide were given orally both morning and evening.

31st July 1941: Temperature 103° F. Urine clear and contained no sediment. Sulphanilamide was continued.

1st August 1941: Morning temperature 104° F. Sulphanilamide was repeated. Evening temperature 106° F. Paraffin liquidum 2 oz. internally and enema were given.

2nd August 1941: Morning temperature 105° F. Sulphanilamide was repeated and Oleum lini 4 oz. was given. Evening temperature 106° F. Sucked milk. Dry dressing to wound was applied.

3rd August 1941: Morning temperature 103° F. Urine, normally passed. Evening temperature 104° F. Repeated sulphanilamide and enema.

4th August 1941: Morning temperature 104.2° F. Urine sediment was stained and on examination contained a number of putrifactive organisms. Sulphanilamide 3 tablets were given. Evening temperature 104° F.

5th August 1941: Morning temperature 102° F. Repeated previous day's treatment. Evening temperature 103° F.

6th August 1941: Morning temperature 102.2° F. Hexamine gr. 20 was given in 2 ounces water. Evening temperature 102.4° F. Dung was still hard and the animal started nibbling at straw.

7th August 1941: Morning temperature 101.9° F. Animal was almost normal and looked lively. The sutures were removed and the wound dressed. Evening temperature 101.6° F.

8th August 1941: Morning temperature 101° F. Evening temperature 101.6° F.

9th August 1941: Cured and discharged.

Result:— The calf is doing well now.

CANINE TICK FEVER (*BABESIA GIBSONI*)

BY

JATINDAR NATH NAGAR,

Veterinary Assistant Surgeon, Amritsar.

Two imported Grey Hounds and their four pups of five month old were brought from Batala District, Gurdaspur, in winter season, with the history of a sudden rise of high temperature without any other constitutional symptoms such as inappetence and a rapid return to normal within a week with simple administration of febrifuges.

On examination, all the dogs had ticks on them and were found dull and depressed with a temperature ranging from 104°F to 106°F. They had a tucked up appearance with difficulty in breathing. Their mouths were foul and the gums were found dirty and bleeding. In two dogs, some swelling was seen in the mandibular space. A peculiar feature noted was that the temperature in all the dogs was found higher than their general physical appearances would seem to indicate, and it fluctuated between 104°F and 106°F. The temperature in spite of the treatment underwent very little remission until the 5th to 7th day when it suddenly dropped to 102°F to 103°F. and remained at that level for several days. In some cases the temperature shot up from 104° to 106°F. without any warning, while in others it fluctuated between 103° to 105°F. This rise of temperature and fluctuation persisted for several days. In spite of the varying degree of temperature, the appetite of these dogs remained normal.

Blood tinged discharge from one or both nostrils, occasional severe diarrhoea, pallor of the mucous membrane were other symptoms observed in all of them. Two dogs had occasional vomiting. In two pups exanthematous eruptions inside the thighs were seen.

Examination of the blood smears throughout the course of illness showed only anaemic changes in the advanced cases and no Piroplasms were detected.

Treatment.—Diagnosis of the cases was not easy as the disease could be mistaken for gastro-enteritis, distemper and pneumonia. Symptomatic treatment was adopted. Glucose water, egg flip and nourishing diet were given and when there was diarrhoea Cal. Gluconate injections were given. Novarsenobillon was given to every dog intravenously at the height of temperature after a week.

Post-mortem findings.—Out of the six cases treated, two died from exhaustion, jaundice and pneumonia. The pup which died weighed 40 lb.

12 oz. Liver and spleen were mainly affected. Spleen increased in weight and was markedly enlarged, dark red in colour and soft in texture. Liver was darker in colour and petechiated and much increased in weight and size. Lymphatic glands were all swollen and enlarged. Blood was thin and watery.

Pieces of liver, spleen, lymphatic glands, bone marrow and blood slide were sent to the Imperial Veterinary Research Institute, Mukteswar, for pathological examination. It was reported that the specimens revealed on histological examination lesions typical of a *P. Gibsoni*, infection.

My grateful thanks are due to Mr. B. N. Handa, B.Sc., M.R.C.V.S., Superintendent, C.V.D., Lahore Division, for useful suggestions given during the treatment of these cases and to the Professors of Pathology and Parasitology, Punjab Veterinary College, Lahore, for kindly examining the blood slides and ticks many a time during the course of the disease of these dogs, and to Mr. J. F. Shirlaw, M.R.C.V.S., Veterinary Research Officer, Mukteswar, for kindly examining the viscerae for pathological diagnosis. I am indebted also to Mr. M. K. Kalia and Jagadish Chander, B.V.A., Amritsar, who took keen interest throughout the course of treatment.

A CASE OF "POST PARTURIENT HYPOCALCIMIA" IN A COW

BY

R. K. MORE, G.B.V.C.,

Veterinary Assistant Surgeon, Civil Veterinary Hospital, Baroda.

I was called upon at 8 A.M., on 4-8-1941 to attend on a sick cow with the history that she had calved a day previous, was off-feed, tympanic and lying prostrate. On examination, the following observations were noticed :

The cow was young and in a well-nourished condition. This was her third difficult calving. Temperature 99.4°F. The animal was found in a state of stupor, lying prostrate with legs stretched and stiff, eyes glossy, pupils dilated, and loss of corneal reflex. There was profuse flow of tears, dribbling of saliva from the mouth and watery discharge from nostrils. An attempt was made to place the head in a normal position but it fell back again. The pulse was imperceptible, rumen tympanic, rectum and bladder full while the respirations were stertorous.

Diagnosis.—The case was diagnosed to be one of Milk Fever or Post Parturient Hypocalcemia.

Prognosis.—From the clinical symptoms and appearance of the animal, the prognosis was not favourable.

Treatment.—Rectum and bladder were emptied and an enema was given. The udder was emptied and then by attaching a rubber tube and a bicycle pump to the teat siphon, the udder was inflated with air. Each quarter was inflated as fully as possible and, in order to prevent the escape of air, all the teats were tied with a tape. The udder was gently massaged to diffuse the air throughout.

Within ten minutes, the patient showed some improvement. There was slight corneal reflex and winking of eyes.

Then a 10 per cent. solution of Calcium Sandoz in aqua distillata — boiled and filtered, was given intravenously. After about 20 minutes, the animal began to shake itself, bend the limbs, sit up, and take notice of the surroundings. A dose of Liq. Strychnine Hydrochlor 3 ii. was given subcutaneously, and Mag Sulph and Pot. Nitrates with treacle was given by the mouth. After two hours, the tapes tied around the teats were removed and in a short time the animal began to ruminate, and move about. By 4 p.m., the same day the animal had passed dung and urine and had begun to eat. A stimulant dose was then given. Next day the animal was reported to be quite well.

Conclusion.—Though the animal was almost in a comatosed condition and had been given up as hopeless by the owner still it recovered within 8 hours by means of adequate and prompt treatment.

A CASE OF PETROL POISONING IN A PUPPY

BY

S. KANTHARAO PATNAIK, G.M.V.C.,

Touring Veterinary Assistant Surgeon, Salur, Madras.

A cross-bred terrier puppy, aged about six weeks was sent by the local Manager of the Burmah Shell Company about 6 p.m., on 17th January 1940 that it had been taken ill suddenly and required immediate treatment.

Symptoms observed.—Profuse salivation with froth and distress. When handled it attempted to bite and ran about aimlessly dragging both the hind limbs. The symptoms were so alarming that detailed examination was not possible. The temperature was 102.4°F. The possibility of the case being one of rabies or of fracture of lumbar vertebrae was negatived, from the history given out by the servant.

The history was that the puppy, up to the time it took ill, was playing about normally in the compound of the Burmah Shell Office where the servants were washing the petrol utensils. Suspecting that the puppy may

have drunk the petrol-water, its mouth was examined when the odour of petrol was easily detected. A diagnosis of Petrol poisoning was therefore made.

Treatment.—Cold water was dashed over the head and body and the puppy dried afterwards with a dry towel. The salivation immediately stopped and it started shivering. When made to walk it was not dragging the hind limbs as before but they were giving way under it now and again. Cold water was given to drink and afterwards a warm soap water enema was given. The puppy took plenty of the water and later on passed small quantity of faeces. Soon it began to walk normally and responded to the call which was not being done previously. By about 7 A.M., it began to run about and play as usual with the servant. It was then sent back home with instructions to put it on barley water as diet for that night and also to give half an ounce of Oleum Recini the next morning. The puppy was seen by me after two days when it was found normal.

AN INTERESTING CASE OF IMPERFORATE ANUS AND VAGINA IN A BOVINE HERMAPHRODITE

BY

S. M. NIMBALKAR, G.B.V.C.,
Veterinary Surgeon, Vaduj, Bombay.

A calf aged 3 days was brought to the dispensary on 11-9-'39 and was admitted as an in-patient.

History.—The owner observed that the animal had no anal opening and had not passed dung since its birth on the evening of 9-9-'39. The animal was said to be struggling violently and straining now and then. When brought to the dispensary the animal was prostrate on the ground.

On examination, I found that the animal had no anal opening, but about 2 inches from the root of the tail it had a perpendicular strong stiff band of muscles 3 inches long and one inch thick covered with skin and hair. At the interior end of the band there was a pin head opening through which, it was observed, urine, liquid dung and gas escaped when the animal strained violently. I also found that the animal had two testes on both sides of the median line—the distance between them being 2 inches.

I decided on surgical interference. With all possible aseptic precautions possibly available in a small dispensary like mine, I introduced a sterile metal probe into the opening and found it passing through the band of muscles. With a sterile scalpel, the canal was opened from the inferior orifice when its sides were found to be thick and strong with mucous

membrane attached to the sides of the incised band. On further examination, I found the band to be the walls of the vagina joined together and covered with skin and hair.

A search for the anal opening was made one inch below the root of the tail. A dissection was made deep into the muscle when an opening was found through which hard and stiff balls of dung escaped. On introducing the small finger, I found a sphincter which was then sutured by continued sutures to the sides of the wound caused by dissection. A soap water enema was given, the part cleaned and Tr. Iodine applied over the wound.

After the operation, the animal got up, looked relieved and smart. It was given then a stimulant dose. For the next two days the animal was looking lively, and relieved and passed liquid faeces through the opening. The stimulant mixture and dressing were repeated. Unfortunately on the fourth day, the animal was stealthily removed and was lost sight of.

AN OBSTINATE CASE OF FAECAL IMPACTION IN A DOG

BY

S. RAMANARAYANAN, G.M.V.C.,

Veterinary Assistant Surgeon, Coonoor.

Subject.—A Dachsund dog, aged 3 years, in good condition.

History.—The dog used to have a single large meal of rice and meat in the evening—with a little milk and a few dry biscuits in the morning. The owner observed the dog on 3-6-41 to be off-colour and straining to defecate with no result, and therefore gave a tablespoonful of Castor Oil hoping that it would clean the bowel; but it had not the desired effect.

Symptoms.—When seen by me on 4-6-41 the dog was straining frequently with the abdomen tucked up and the trunk arched, temperature 102.2°F, would not take notice of any food placed before him. On rectal examination severe resistance was felt but there was no trace of faecal matter.

Treatment.—High enemata of warm water and soap at intervals of two hours were given four times but all the time only the water was thrown out. A dose of Liquid Paraffin 3i with Spts. Ammon. Aromaticus xv m. and brandy was given and also a powder containing Calomel 1 gr. with Sodi Bicarb x gr. was administered every hour in honey for 4 hours.

There was no action whatsoever until 9 P.M. The dog was miserable and haggard looking from constantly trying to defecate. An injection of Pituitrin $\frac{1}{2}$ c.c. was given and in half an hour the dog behaved as though he

was going to have a good motion but only some quantity of mucus was passed. A second injection of Pituitrin $\frac{1}{2}$ c.c. was then given. Within a few minutes, the dog gave a shriek and passed a very hard lump of faeces about 2 inches long and very thick for the size of the dog followed by soft faeces. Relieved of the burden he drank some milk. It was only with great difficulty that the hardened faeces could be broken and it contained tiny fragments of bone as well.

The relief for the dog was immediate and it drank some milk. The anus was sore for a few days and there was a slight straining but the dog made an uneventful recovery.

A CASE OF ECLAMPSIA IN A BITCH.

BY

S. RAMANARAYANAN, G. M. V. C.,
Veterinary Assistant Surgeon, Coonoor.

Subject.—A pure bred Cocker Spaniel bitch aged about 3 years, not in good condition was brought to the veterinary hospital, Coonoor, on 30-6-41 an 9 A. m.

History.—Whelped on 19-6-41 and gave a litter of 5 puppies. All of them were in good condition and were sucking till that day. During the previous whelp she had 3 puppies and all of them died in a few days. Subsequently during the next heat itself, she was mated and the result of this mating was the present litter of 5 puppies. It was reported that on the morning of the date of admission *i. e.* on 30-6-41 the owner took the bitch out for a run as usual. The bitch strolled along the compound and had a motion. Then it began to walk unsteadily and returned into the house staggering and fell down with violent fits. The owner immediately rushed the patient to the veterinary hospital and said that the bitch had developed rabies.

Symptoms.—On examination, the animal was found unconscious, frothing from the mouth with clonic convulsions. Pulse wiry and accelerated, breathing very rapid, temperature 104.4° .

Diagnosis.—Parturient Eclampsia.

Treatment.—Gave immediately an intramuscular injection of 5 c. c. of Calcium Gluconate 5 per cent. Then a warm soap enema was given. Considerable quantity of semisolid faeces was passed. Within a few minutes of the attack the virulence of the fits had reduced. Camphor in

oil (3 grains to 1 c. c.) was given as a cardiac stimulant and the animal was left lying down in an airy room after giving the following mixture :—

R. Sodii Salicylas xii gr.
Pot. Citras. v gr.
Tr. Gentian Co. xv m
Aqua chloroform $\frac{3}{4}$ i
M. ft. mist. sig at once.

By 12 noon the fits had completely subsided. The bitch began to raise her head and look around, drank of her own accord a little milk and glucose D, even though she was not fully conscious. By 1 p. m. she completely regained consciousness and tried to move about. She looked practically normal except for her weakness. She was allowed to be taken home at 2 p. m. and advised to be put on liquid diet only for the day. The puppies were weaned from that day and the mother was put on a course of Parathyroid and Calcium. She made an uneventful recovery and improved in general health.

Remark—Text books on Veterinary Medicine say that Eclampsia occurs within a few days after parturition. In this case, it was noticed after 12 days, presumably the case is one of Hypocalcaemia (due to the 5 puppies draining her when in poor condition) as is evidenced by the beneficial effects of Calcium therapy.

A CASE OF SURRA IN A DOG

BY

O. LAKSHMANA RAO., G. M. V. C.,
Veterinary Assistant Surgeon, Gudivada.

A country bred dog, aged about one year, was brought to the Veterinary dispensary, Gudivada, on 25-5-41 with the history that it was taking its food irregularly for the past week and that its bowels were constipated.

On examination, the animal appeared to be very dull and depressed. The mucous membranes were anaemic and there was slight oedema of the legs. The temperature was 103.8° F. An opening dose of castor oil 1 oz., was given and blood smears were taken. These were examined by the District Veterinary Officer, Bezwada, who was then camping at Gudivada. Trypanosomes were detected.

The next day the temperature came down to 100.2° F. 1 c. c. of 1 per cent. solution of antimonium tartaratum was given intravenously.

29-5-41. Temperature 105.4°F. Blood smears which were submitted to the Principal, Madras Veterinary College, revealed Trypanosomes. On this day Salol and Sodii Bicarb gr. x of each made into powders were given morning and evening. Liquid diet was also prescribed.

30-5-41 and 31-5-41. Temperature 101.6°F. The above powders were repeated.

1-6-41. Temperature 101.4°F. Repeated the same powders.

2-6-41. Temperature 103.4°F. Injected 1 c. c. of 1 *per cent.* solution of antimonium tartaratum intravenously. As conjunctivitis was noted the eyes were washed with acid boric lotion and argyrol 25 *per cent.* solution was instilled into the eyes. Internally the following mixture was given:—

R_x

Sp. aetheris Nitrosi

Sp. Ammon. Aromaticus $\bar{a}\bar{a}$ ms. v

Sodii Bicarbonas gr. v

Aqua 1 oz

Blood smears taken and submitted to the Principal, Madras Veterinary College were positive for Trypanosomiasis.

3-6-41. Temperature 105°F. Repeated the above mixture and injection. The blood smears were still found to contain Trypanosomes.

4-6-41. Temperature 101.4°F. As the appetite did not improve, 1 oz of carminative mixture was prescribed.

5-6-41. Temperature 101.2°F. Repeated the carminative mixture.

6-6-41. Temperature 101.4°F. Repeated the above mixture. The animal discontinued from 7-6-41.

The owner, after ten days, informed me that the animal was taken to a village 8 miles off and that it was quite normal in health ever since.

Association News

THE BOMBAY VETERINARY MEDICAL ASSOCIATION

A. R. P. AND ANIMALS

The Bombay Veterinary Medical Association formed a committee of A. R. P. for Animals, with Khan Sahib N. D. Dhakmarwalla as President, K. R. Alur, Lecturer, Veterinary College, Bombay, as the secretary, and staff of the Veterinary College, Bombay, with Messrs D. S. Laud and Pereira as the members. At the request by the President the body was affiliated to the A. R. P. organisation, Bombay. On being recognised, training of wardens was started and till to-day 200 wardens are trained who are all fully qualified, comprising of 32 Veterinary Surgeons and the rest students of the Veterinary College, S. P. C. A. agents and medical attendants of the Bai Sakharbai Dinshaw Petit Hospital. Almost all the Veterinary Services in Bombay are represented. Including Veterinary College there are officers from the Bombay Municipality, Health and Market Department and the Society for Prevention of Cruelty to Animals.

In connection with the recent rally of all A. R. P. wardens for being presented to His Excellency the Viceroy, the Association was represented by 70 wardens, with one Travelling Motor Dispensary, one Animal Ambulance and a push bicycle for dogs. Principal M. Mohy Deen, Veterinary College, Bombay, was requested to lead the batch of wardens, and then onwards he continues to be the head of the organisation as the "Chief Warden." Mr. S. J. Khambete was co-opted as the Joint Honorary Secretary due to pressure of work.

Creation of first aid posts all over Bombay in cattle populated areas is a scheme under consideration and is nearly complete.

All the wardens were presented to Mr. D. Simington, A. R. P. Controller, Bombay, who watched a demonstration by them in High Explosive and Incendiary bombs in relation to animals, in the presence of high and distinguished guests. On hearing the report from the secretary he congratulated the Association for having done splendid work and advised them to get in to working manner as early as possible and get enrolled under the A. R. P. ordinance as a measure of self-protection.

Correspondence.

To
THE EDITOR,
INDIAN VETERINARY JOURNAL, MADRAS.

SIR,

Please publish the following Appeal in the columns of the *I. V. J.*

Trivandrum,)
27-12-1941.)

Yours faithfully,
M. V. PILLAI.

AN APPEAL TO THE VETERINARIANS IN TRAVANCORE

Being a Travancorean and having served in the same place for a short period, I believe I have a right to make this appeal to my friends and colleagues of the Veterinary Department through the medium of our esteemed *journal*, with a firm belief that it may not be thrown over-board, especially at a time like this when the world is trembling with horrors of war, unprecedented in history.

We belong to a ancient country with a historic tradition behind. We must be proud that our state is sufficiently known out-side as one of the first rate states well advanced in all activities, notably education. The recent establishment of an university and introduction of Technical education speak volumes of the rapid advancement that Travancore has made during recent years. But with all these I must express that the welfare of the masses is not very much improved. The greatness of a country or a state does not depend upon magnificent buildings or a few men holding coveted positions in Government service. It is the general welfare of the common masses that will determine the prosperity of a State. Since majority of our people are engaged in agricultural industry, which, not only includes raising of crops from the soil but also cattle breeding, dairy farming, poultry rearing and goat breeding, it necessarily follows that the development of this industry for the economic welfare of the agricultural community is a major problem. More cattle means more manure; more manure means increased production of crops for human beings and animals due to increased fertility. From this it will be seen that live stock and agriculture are so intermingled that one cannot be seperated from the other. So long as the cattle are poor and deteriorated there is a great loss in national economy and national health. They give us work so long as mechanisation is absent, they give us milk, the most nourishing food on earth, they give meat to those who eat, they give us ideal manure for agricultural operation. It is on account of these manifold benefits that cows are worshipped by the Indians from ancient times. It is to protect the health of these animals of national importance, the veterinary departments have been established and organised all over British India and Indian India.

In Travancore there is a veterinary section as a branch of the Agricultural department which has been in existence for the last 25 years or a little more and functioning at a snail's space. The progress of this section and its organisation and equipment, when compared with other provinces and states, are so slow that the activities of the Travancore veterinarians are more or less the same as it was 25 years ago. The creation of a separate Superintendent under the mercy of the Director of Agriculture is the only substantial re-organisation that has taken place during this quarter of a century. Colossal ignorance and indifference on the importance of Scientific veterinary work among the intelligentia still prevails even in these days of rapid scientific advancement; facilities for investigation of obscure diseases among animals and its scientific application for their prevention are hopelessly lacking; equipment in buildings and other apparatus, necessary for an up-to-date institution, is far from satisfactory; veterinarians themselves, due perhaps to insufficient encouragement, are not interested in keeping pace with other scientific bodies in and out-side Travancore with the result that they do not command so much of social status, dignity and self-respect as others. So long as this section remains under the control of the Agricultural Department and receives a stepmotherly treatment, this emaciated baby section cannot hope to get any nourishment for its growth and development.

The only thing that can speedily solve this long standing and chronic state of affairs and thereby bring the profession to the forefront, is to organise an association among the veterinarians with the object of safeguarding the interest of the profession. In these days when the whole world is crying from house tops for democracy and freedom and when every profession and trade have their unions and organisations which afford opportunities in promoting their respective interests, Travancore veterinarians have lost a good opportunity and remained indifferent for an unusually long time. Look at the immense benefits that the veterinarians derived through that influential body "*The All India Veterinary Association*" and its only organ "*The India Veterinary Journal*."

The usefulness of such an organisation cannot be over-estimated. It is here that all members can meet, talk and discuss various problems of professional and service interest; promote feelings of mutual respect and friendship and create a better scientific spirit and awakening among them. An efficient and ideal association will also be able to enlighten the cattle owners and breeders and make them to appreciate the value and usefulness of the work carried out by them for the welfare of the agricultural community. It can, with the support from the public, government, local bodies and other sister professions, also serve as a sort of advisory body to the Government by submitting various proposals for the improvement of the Department. By doing this, I am sure, we will prove ourselves to be worthy members of the profession and gain confidence and support from the people.

It is therefore my earnest request that Travancore Veterinarians, both retired and service men, now living in isolated conditions having no facility to meet in a common place, must come forward with an united heart, shaking their chronic lethargy and sub-merging all petty differences and flimsy jealousies and form an Association under the leadership of some able retired man through which we will be able to serve the country and the people.

‘Serving the people is Serving God’

Unity is Strength.

Extracts

THE RELATIONSHIP BETWEEN CANINE HYSTERIA AND DOG BISCUIT. BY R. C. G. HANCOCK, B.Sc., M.R.C.V.S., *Beaconsfield.*

My excuse for returning to this well-worn thesis is the fact that I have been able in some small degree to confirm by experiment certain views I expressed many years ago on the aetiology of this complaint.

I will not weary readers with details of the symptoms of canine hysteria. They are well known to all who practise with dogs. I do feel however, that there is room for great improvement in the differential, diagnosis of the canine hysterias. In reading through the literature one cannot but observe that writers often lump two or three different hysteric conditions together as though the cause must of necessity be a common one to all. The object of what is written here is to emphasise and help to prove that there is an infective biscuit-borne hysteria of the dog. Articles have been written and research conducted to incriminate other articles of food commonly used for dogs. All I am concerned with at present is to draw attention to the fact that biscuit made from flour from certain sources can bring on attacks of hysteria in a large proportion of dogs that consume it, even after many months of issue from the manufacturer. Before I recount observations and experiments that bear out this contention, there are some general considerations that ought to be borne in mind.

It is not sufficiently recognised that the dog tribe, to use a horrid word, is extremely psychic. Clairvoyance and clairaudience are by no means confined to the human species. The dog possesses the peculiar power of rapidly passing from the reception of those wavelengths of sight and sound normally accepted by optic and aural nerves, to another set of wavelengths during the use of which the phenomena that are seen and heard are often of such a nature as to induce extreme terror. One has only to consider the clairvoyance induced by advanced alcoholic poisoning, with its concomitants of rats and serpents, to make this point clear.

So first of all the student of hysteria must come to recognise that our canine subjects are an easy soil for hysterigenic agents.

Next we must recognise that the process of breeding dogs for so-called "points," which implies close in-breeding, cessation of natural selection, with its unnatural rejection of fit progenitors, has increased to a great degree the borderline mental cases that are such easy subjects of hysterias of a purely endogenous character.

We who keep kennels know to our sorrow how contagious is the howl of the homesick dog. One new entrant of this type can convert a peaceful kennel into a place of noise and unrest by day and by night, for the chorus of sympathy is very hard to check. Then the cry of a patient in pain, an epileptic seizure, a death in the kennels, can all engender the pack howl, so that it is hard to know which inmate is responsible for the group manifestation. I am sure much of this mass hysteria that occurs from time to time in greyhound kennels is of this nature, and from the neurosis of one individual is set in motion the large-scale veterinary treatment of a number of dogs whose sole disease is mass sympathy with the hysterical complaint of one neurotic and may be unrecognised culprit. Moreover, I am convinced that much time and research have been wasted over outbreaks of this nature, when a little attention to the natural history of the dog family would have shown that there was no ground for laboratory intervention.

Assuming that there is, as I believe, a specific biscuit-borne hysteria of the dog, what postulates must we seek to allow us to think that an outbreak of hysteria under review is of this type? First, of course, that biscuit is being used. Secondly, that it has usually been a new consignment, often taken into use some three or four days before the attack of hysteria commences. In the case of solitary pets, as we meet them in most households, we may often have our suspicions confirmed by further cases in the district, the same dealer and brand of biscuit being involved. In 1932 I was able to trace 25 separate household outbreaks to one dealer and one bin. And the last two or three occurred with a different biscuit that had been put into the bin occupied by the hysterigenic biscuit and had presumably been contaminated thereby. When biscuit hysteria occurs in kennels it affects most of the animals consuming it. Finally, the feeding of hysterigenic biscuit to animals experimentally will induce the disease.

As to the causative agent of this hysteria, it has yet to be isolated. My observations have led to some peculiar findings, but as a whole they all point one way. I would group the disease with the allergic complaints such as the asthmas. The causal material resists heat, as witness its survival through biscuit manufacture, though after reading the history of the survival of the biscuit weevil in army biscuit* this is not so astonishing as it seems at first sight. It is not so resistant to cold, and I believe the most likely preventive that can be utilised by biscuit manufacturers when they learn that their biscuit is contaminated will be a freezing process to destroy the active agent.

I have not been able to infect dogs by exposing them to urine and faecal contact in kennels previously occupied by a known case, but I would not altogether rule out the possibility of this occurring, although I believe it would require day by day ingestion of infective excreta to accomplish this. The infection seems undoubtedly to be cumulative. That is to say,

* Shipley "The Minor Horrors of War," Chap. IV. (Smith Elder, 1915).

the biscuit has to be fed for at least three days and to constitute the bulk of the daily ration to bring on attacks. Small doses or intermittent use of the biscuit with a day or two's interval between administration leads to temporary immunity, which can be broken down a week or two later by more intensive administration. Another peculiar feature is that the older the biscuit the longer is the experimental incubation before hysteria develops. The addition of milk and/or a vitamin-mineral concentrate to the infective biscuit did not check the development of attacks.

My views as to why some biscuit is infective, although the bulk of biscuit is not so, are not without careful observation to back them. First it is very difficult to get a manufacturer to own that his biscuit is pathogenic. When he admits as much then it is equally difficult to get from him the sources of his flour supply and their countries of origin. The one manufacturer who proved most hopeful, even to the extent of sending me a liberal supply of biscuits returned to him as having caused hysteria, insisted on anonymity or his name would appear in this paragraph in grateful acknowledgement. Without wearying the reader, suffice it to say that flour from the Far East seems to be the usual source of the disease, and that it is not of a quality that would usually be used, except at times of rising prices when competing biscuit manufacturers must keep down their costs. So hysteria follows crises in world affairs that impinge upon grain supplies. My working hypothesis expressed in 1930* remains the same, that it is a pollen or seed contaminant of inferior quality grain.

My first contact with authentic biscuit hysteria (I think it is time a new word such as kunophobia was coined for this entity) was in 1926, when in consultation with the late Mr. Sewell, I dealt with an outbreak in an Airedale kennel. This has already been recorded, but from it I learned one or two facts that have since been confirmed by later observations. These were that biscuit holds the infective agent for a long time (in this instance six months) and that the incubation of later attacks in previous victims may be only a matter of hours from the commencement of feeding infected material.

It was not until the early days of the present war that I was able to obtain sufficient material to start feeding experiments on selected subjects under my personal observation. For, owing to the lack of patients and boarders, I was able to isolate, and successfully too, a portion of my kennels for the purpose. It was not without some excitement that I found that my first subject fed on suspected biscuit went down with an attack at the 52nd hour. I was then brought to realise that further experiments of this type might come within the law governing experiments on living animals. Conversation with laboratory people possessing experimenters' licences did not lead me to think I should be able to obtain one. And I would like here to pay tribute to the quick help and sympathy of Dr. J.A. Giles, of the Home Office, which resulted in my obtaining the necessary licence to continue experiments.

At foot is a table showing the results of feeding biscuit previously known to have set up hysteria. The biscuit was supplied by a firm of well known manufacturers with the history that it had been returned to them having been the source of a hysteria outbreak. It appeared to be a good average whole-meal terrier meal. It only failed to produce hysteria in two out of eleven instances, one an aged dog, which in my experience have for the

* *The Veterinary Journal*, March 1930.

most part immunity. In No. 11, the Kerry Blue, the supply of biscuit failed at this point so I do not know whether the age of the biscuit or of the subject, caused negative result, though it was probably the former, as the biscuit had been left exposed in an open shed to several weeks of frost, and I did not expect a positive result after this freezing of the biscuit. Note the lengthened incubation as the age of the biscuit increases. In every case the quantity was 4 oz. of biscuit twice daily fed dry, except in No. 8, when cow's milk was added. My first assumption when Admin and then milk was added was that it delayed the onset of attacks, but this was negated by the result with No. 10.

<i>Subject.</i>	<i>Material fed.</i>	<i>Biscuit age from Manufacturer.</i>	<i>Attack, Hours' Incubation.</i>	<i>Remarks.</i>
1. Black Labrador dog, 2 years	Biscuit alone	70 days	52 hours	
2. Golden Labrador dog, 2 years	„	70 „	56 „	
3. Golden Labrador bitch, 3 years	„	70 „	56 „	
4. Airedale bitch, 1 year	„	76 „	59 „	
5. Aged Sealyham	„	86 „	None	Fed for 7 days. High blood pressure.
6. Terrier, 1 year	„	203 „	71 hours	Fed again 14 days later. Attack at 74th hour.
7. Terrier, 3 years	„	219 „	76 „	
8. Sealyham, 1½ years	Biscuit and milk	281 „	192 „	
9. Mongrel terrier, 2 years	Biscuit and Admin	291 „	248 „	
10. Scottie, 2 years	Biscuit	317 „	204 „	C. f. 8 and 9
11. Kerry Blue, 7 years	Biscuit	528 „	None	Age of dog? Age of biscuit?

PHARMACOLOGICAL ACTION OF THE ESSENTIAL OIL OF

CURCUMA LONGA.—BY BREVET-COLONEL SIR RAM NATH

CHOPRA, M.A., M.D., SC.D. (Cantab), F.R.C.P. (Lond.), C.I.E., I.M.S. (Retd.)

AND G. S. CHOPRA, M.B., B.S., A.I.R.O. (From the Department of Pharmacology, School of Tropical Medicine, Calcutta.)

Introduction.—Of the two species of *Curcuma* growing in India, namely *Curcuma longa* and *C. aromatica*, the former or the real turmeric is extensively cultivated in this country. The rhizome of this plant is popularly known as 'haldi' and is used both as a condiment and a dye. *C. aromatica* Salisb., also known as wild *Curcuma* (Sanskrit: Vanaharidra; Hindi: Jangli haldi; Bengali: Banhalud; Behari: Banhaldi; Malayalam: Kasturimanjal), grows wild in some parts of Mysore State and is probably indigenous to various other parts of India. The plant as a whole contains the colouring matter, the underground rhizome containing the greater part of it.

Turmeric in the indigenous medicine.—From times immemorial turmeric has been used by the Ayurvedic and the Unani Schools of medicine in India as a stomachic, tonic and a blood purifier. It has its use also as an anti-periodic alterative. Household turmeric mixed with warm milk is said to be beneficial in common cold. The fresh juice from the rhizome, a paste prepared from it or the decoction of the plant, is often employed against leprosy, snake-bite, vomiting of pregnancy and affections of the liver. Murray advocates its use in troublesome diarrhoeas in atonic subjects, Baden Powell found it to be effective in intermittent fevers and dropsy. The fresh juice from the rhizome is believed to be antiparasitic for many skin affections. Externally it is used for indolent ulcers and a paste made from the powdered rhizome along with caustic lime forms a soothing remedy for inflamed and angry joints. A decoction made from the rhizome is said to relieve pain of purulent ophthalmia. It is still a common practice in India to use a piece of cloth soaked in turmeric solution for wiping away discharges in acute conjunctivitis and ophthalmia. Finely powdered turmeric mixed with alum forms a common household remedy for otorrhoea. A thick watery paste of 'haldi' is used on many auspicious occasions amongst the Hindus in this country. The smoke produced by sprinkling powdered turmeric over glowing charcoal is said to relieve pain due to scorpion bite.

Chemical considerations:—The chemical formula of *Curcumin* the yellow colouring matter of turmeric, is either $C_{10}H_{10}O_3$ or $C_{15}H_{16}O_4$. It melts at $172^{\circ}C.$, forms red-brown salts with alkalis, is converted by boric or sulphuric acid into rosocyanine, by reduction with zinc dust into an oily body, by oxidation into oxalic or terephthalic acid and by fusion with potash into protocathechuic acid. Oil of turmeric is distilled from the dried rhizomes of *Curcuma longa*. Fresh rhizomes yield 0.24 per cent of a yellow coloured oil which is soluble in 75 per cent alcohol. Turmeric oil contains *phellandrene*. Oil extracted from Bengal turmeric with petroleum either when fractionally distilled under reduced pressure gave the following fractions: (1) boiling below $193^{\circ}C.$, (2) at $193^{\circ}C.$ to $198^{\circ}C.$, (3) viscid semisolid residue. The

middle fraction, after purification, seemed to contain an alcohol, 'turmerol'. of the composition $C_{10}H_{18}O$ described as a pleasant aromatic smelling oil with a density of 0.901 at $170^{\circ}C$.

Pharmacological Action of *Curcuma* Oil

The Director of the Indian Institute of Science, Bangalore, kindly sent us a sample of the yellow essential oil isolated from *Curcuma longa*. We have attempted to work out the pharmacological actions of the oil; the results of our experiments are given below :—

Action on Paramecium caudatum.—The effects of *Curcuma* oil in different concentrations were studied on *P. caudatum* kept on a glass-slide with six small chambers. The addition of the oil in concentrations varying from 1 in 2,000 to 1 in 5,000 resulted in paralysis and subsequent death of the organisms; complete disintegration with loss of shape was a marked feature. With weaker dilutions of the oil, such as 1 in 10,000 to 1 in 30,000, the ciliates at first became active but were later sluggish and ultimately died within 10 to 30 minutes. The organism did not undergo any change with higher dilutions of the oil, such as 1 in 50,000 to 1 in 100,000.

Action on the bacteria.—The bactericidal properties of the oil were tested on *Staphylococcus albus* and *aureus*, and *B. typhosus*.

The growth of cultures of *Staphylococcus aureus* and *albus* was inhibited in concentrations up to 1 in 5,000. The growth of cultures of *B. typhosus* was not inhibited even in a concentration of 1 in 1,000.

Local action.—The essential oil has a strong aromatic odour, and applied locally it has a slightly irritant action on the unbroken skin. Applied to the mucous membranes it produces well-marked vasodilatation. A one per cent solution of the oil when instilled into the eyes of a rabbit produces slight redness of the conjunctiva but does not produce any local anaesthesia. One or 2 per cent solution of the oil if injected deep into thigh muscles of a cat does not produce unpleasant symptoms or appreciable congestion, oedema or necrosis at the site of the injection.

Action of the gastro-intestinal tract. (a) *Carminative effect*.—Taken by mouth, the solution of the oil has warm aromatic taste and it promotes the flow of saliva. Taken internally in doses of 5 to 10 minims suspended in water the oil gives rise to a feeling of warmth and sense of comfort in the stomach. It, therefore, seems to act as an appetizer, stomachic and tonic. Large doses, such as 2 c.c. to 4 c.c. of the concentrated solution of the oil, give rise to sharp pain and discomfort in the epigastrium and induce salivation, retching and vomiting.

(b) *Effects on the gastric secretion* :—Free and total acid contents of the gastric juice were determined on the same subject on two different days, observations being made on patients in the Carmichael Hospital for Tropical Diseases during fasting. A Ryle's tube was introduced into the stomach and 15-minute samples were aspirated and collected for examinations on two different days. On the first day the samples were collected after administration of 50 c.c. of 7 per cent ethyl alcohol alone and on another

day, after 50 c.c. of 7 per cent ethyl alcohol administered after 10 c.c. of 1 per cent *Curcuma* oil. The contents were withdrawn every 15 minutes for 2½ hours and the total and free acids were determined.

The results obtained after fractional test meal on different individuals show that the administration of *Curcuma* oil is followed by a marked diminution of secretion of the acids in the stomach.

(c) *Action on the small intestine* :—The movements of the small intestine were studied in chloralosed cats with Jackson's enterograph. The essential oil in 1 c.c. to 2 c.c. doses of a 1 per cent solution at first produced slight increase of the tone followed by subsequent relaxation of peristaltic movements. The injections of the essential oil to the isolated pieces of kitten's intestine in the Dale's birth produced similar but less marked effects.

Action on the cardiovascular system. (i) *On the blood pressure* :— The oil injected in different doses intravenously into cats under urethane and chloralose anaesthesia always produced a fall in blood-pressure. With smaller doses such as 1 c.c. or 2 c.c. of a 1 per cent solution of the oil, the fall in blood-pressure was abrupt but recovery was also rapid. This fall in pressure was, however, marked and maintained with larger doses, such as 2 c.c. to 4 c.c., but the pressure in all experiments returned to normal.

(ii) *Action on the blood vessels*.— The fall in arterial blood-pressure was always followed by a decrease in the volume of the intestine and the spleen but with a rise of the limb volume. The re-distribution of the blood, therefore, appears to be directed towards the peripheral blood vessels which show dilatation.

(iii) *Action on the heart*.—The myocardiograph experiments in the anaesthetized cats showed slight stimulation of the auricles with dilatation of the ventricles. The injections of larger doses such as 2 c.c. to 5 c.c., however, resulted in diminution of the amplitude of contractions of both the auricles and ventricles.

Action on the respiratory system.—The effects of the essential oil were studied on the respiration of cats under urethane anaesthesia. An increase in both the rate and the amplitude of the respiratory movements was obtained with smaller doses, such as 1 c.c. or 2 c.c. of a 1 per cent. solution of the oil.

Summary and conclusions.

1. The essential oil of *Curcuma longa* appears to have feeble antiseptic properties.
2. The secretion of acid of the gastric juice is inhibited ; it acts as an antacid.
3. It seems to share the carminative property of other essential oils. In large doses it appears to act as an antispasmodic inhibiting the excessive peristaltic movements of the intestine.
4. The effects of the oil on the cardiovascular and the respiratory system are not marked and therefore not of much importance from therapeutic point of view.

Acknowledgement.

We are grateful to the Director of the Indian Institute of Science, Bangalore, for kindly supplying us the essential oil for this investigation.

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Reviews.

THE PRINCIPLES AND PRACTICE OF FEEDING FARM ANIMALS.

By E. T. HALNAN, M.A., Animal Nutrition Research Institute, School of Agriculture, Cambridge, and F. H. GARNER, M.A., Cambridge University Lecturer in Agriculture (Animal Husbandry), 1940. pp x 359. 8 figs., 41 tables, 23 photographs, 1 appendix. Longmans, Green & Co., London. 8vo. 15s.

The Veterinarian of the present day is becoming more and more an Animal Husbandry Expert and as such is expected to be well-equipped with the principles and practice of feeding the animals of the Farm. This volume under review is a useful guide for a practising Veterinary Surgeon, as well as the Veterinary student and can be recommended to the Veterinary Profession.

The book is written in simple language and is divided into 2 sections. Section A deals with the chemical composition of various feeding stuffs and also their biological value. Section B contains the general principles underlying the feeding of farm animals with separate chapters for Feeding rearing cattle, dairying cattle, fattening cattle, sheep, pigs, horses and poultry. A special chapter is devoted to the feeding in War time.

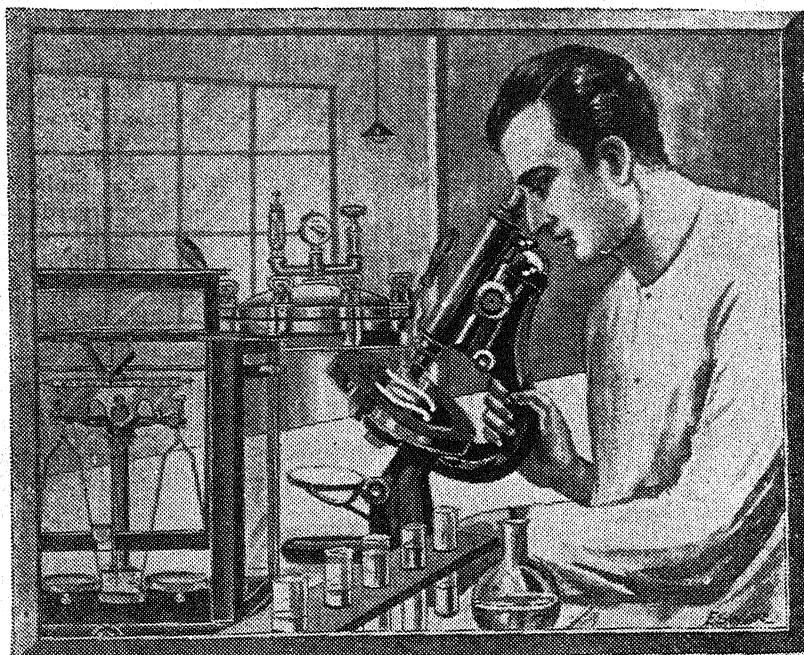
The practical considerations deal with the conditions obtaining in British Isles but, with suitable modifications, they may be applied to other countries also.

The value of the book is enhanced by some fine photographs of Farm Operations in the United Kingdom and Tables containing Ration Ready Reckoner of succulent fodder and concentrates and also the composition and nutritive value of feeding stuffs.

Review of the Annual Administration Report of the Veterinary Department, Mayurbhanj State for the year 1940 — 41.

As in preceding years, this Department formed one of the constituent parts of the Development Department with the Director of Development at its head. The actual strength consisted of five veterinary assistant surgeons, one compounder, one clerk and eleven attendants. All the veterinary assistant surgeons are graduates of the Bengal Veterinary College and one of them has received post-graduate training at Patna in Behar.

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Of the four veterinary dispensaries in the State, one is located at Baripada, the capital town of the State, and the other three at each of the remaining three sub-divisional headquarters. These dispensaries are fairly well equipped with medicines, instruments and sera. The three dispensaries in the outlying sub-divisions have twofold functions to perform. In addition to their duties in the dispensary at the headquarters, the assistant surgeons in charge have got to tour in the interior for at least 20 days administering medicines, performing operations and combating cattle epidemics. In the Sadar sub-division, however, there is a second veterinary assistant surgeon exclusively for itinerant duties in the villages. The members of the itinerant staff in addition to their usual duties also work as propaganda officers for educating the mass in methods of improvement of cattle by means of lectures, talks and visual demonstrations. Leaflets and charts published in the local vernacular are widely distributed to impart general knowledge to the masses about the need of care and improvement of the cattle, the common diseases of the cattle and how to treat them and other useful subjects. The features go considerably to contribute to the increasing popularity of these institutions which have by now gained a definite preference over the indigenous, ignorant village quacks.

The year under report was undoubtedly a bad year for the bovine family in the State owing mainly to excessive rains and unprecedented floods. Though fortunately no loss of life was reported, the floods caused a great scarcity of fodder over large areas affecting the general health of the cattle. Credit goes to the Department for its prompt preventive measures taken against any outbreak of epidemics that usually follow such devastating flood and fodder scarcity.

The State animals, however, such as horses, elephants cows etc. maintained a satisfactory health all through.

Cattle epidemics. Of the diseases common to the locality, prominent are Black-quarter, Hæmorrhagic Septicæmia, Rinderpest, Foot and Mouth disease and Anthrax.

For the last five years the State was free from Anthrax but during the year under report it re-appeared at certain places causing cent percent death roll. Its spread was however checked by immediate precautionary measures from the Department.

Goat Tissue Vaccination was continued to be carried on during the year before, and during the actual out-break of Rinderpest the results achieved were very encouraging, the re-action being very slight.

The following table will show the number of animals vaccinated or inoculated with different kinds of vaccines and serums during the year under report.

A. R.	H. S.	B. Q.	Anti Anthrax	G. T. vaccine
747	1,743	304	815	2,514

Treatment of animals by the staff. There is a steady increase in the number of general cases treated by the staff. During the year under report such cases numbered 28,400 against 18,064 of the previous year. Of these 25,189 were new cases and 3,211 old. The animals treated were mainly

cows and buffalves, other animals such as horses, elephants, goats and dogs being only 2,578 in all.

In addition to these 2,429 cases of foot and mouth diseases were also treated. During the year, 212 operations, both major and minor were performed by the staff. Bloodless castrations are gradually becoming popular through the propaganda carried on by the staff in the villages and the bull calves that were castrated during the year numbered 800 against 778 of the preceeding year.

Eight post-mortem examinations were also undertaken during the year, two out of which were at the instance of the Police.

Days on tour. The Itinerant Veterinary Assistant Surgeons and a Compounder spent a total number of 970 days on tour visiting 1,256 villages.

Annual Report of the C.V.D. Orissa, 1938-1939:— The same I.C.S. officer held charge of the Department as Director of Development, with an Assistant Director of Veterinary Services as his technical adviser. After the formation of the province, the Behar and Orissa Veterinary Manual was applied to the whole area for the first time during the year and the only one post of the District Veterinary Officer was abolished. There was only one post of the provincial cadre against two in the previous year. There were 39 (36) subordinates. An Imperial Dairy Diploma holder was appointed as manager of the Cuttack Agricultural Farm Dairy herd. The proposal to appoint a provincial Livestock officer was still under the consideration of the Govt. Dearth of Oriya graduates was experienced as has been expressed in the report. The reason for this is same as in other provinces and has been clearly explained in the Sept. issue of this Journal last year. There were 3 (2) students from Orissa under training in the Patna Veterinary College. Under a new scheme, 17 men received 10 months training as stockmen. The subordinates were given training in the cultivation and preservation of fodder crops.

There were 23 (22) touring veterinary surgeons. Mortality from contagious diseases was 3603 (2755). The increase was due to greater incidence of R.P. and H.S. The number of outbreaks of contagious diseases was, however, 1888 (2043). Preventive inoculations done were 205835 (49614). Rs. 6244/- (Rs. 4679) were spent on the purchase of sera and vaccine.

The number of veterinary institutions remained 8 in which 66613 (66060) cases were treated. 33 (32) rural veterinary dispensaries treated 34810 (33397) cases. The increased figures show the increased popularity of the treatment. There are 32 (31) breeding centres. 122408 (122840) cases were treated by the touring staff, who visited 12552 (12952) villages. 29378 (27972) castrations were performed. The Utkal Gomangal Samiti received Rs. 1500/- grant from the Government and held 13 (6) cattle shows. An investigation officer was appointed during the year by the I.C.A.R. for this province. He submitted a separate report on his work which has been appreciated by the Government.

The report records a satisfactory expansion of the normal work of the department.

Annual Report of the C.V.D. United Provinces, 1938-1939:—The scientific staff of the department consisted of a Director, three Superintendents, a veterinary Investigation Officer, 21. Veterinary. Inspectors and 200 veterinary asst. surgeons. There were 192 (187) Veterinary hospitals and dispensaries in which 529761 (497832) cases were treated and 85940 (70902) cases were supplied with medicines. 113253 (82366 cases were treated by the touring staff. Total number of castrations done was 125,571 (121,304). 12 cases of poisoning in animals were reported. Number of out-breaks was 1300 (2393). Mortality from contagious diseases was 44922 (33992), R.P. & H.S. order being mainly responsible for the increase. Mortality from causes(?) was 4855 (5587). 515 cases of Surra equines and camels were treated. 537366 (323452) preventive inoculations were done. In the three circle laboratories 1147 smears etc were examined. There were at stud 429 (352) approved bulls, 86 99), 57 56 stallions and 9 (10) jacks during the year.

35 important cattle and horse fairs and shows were held and attended by the staff who also carried on propaganda. A special feature was a number of one-day horse fairs held in the province during the year.

There were 233 (233) licensed (Municipal and cantonment Board) and 33 (34) unlicensed horses in which 1080982 (1192488) animals were slaughtered but no mention is made in the report as to the number of slaughter houses under the management of Veterinarians and Non-Veterinarians. Supply of this information in future reports will be of interest to the profession and the public.

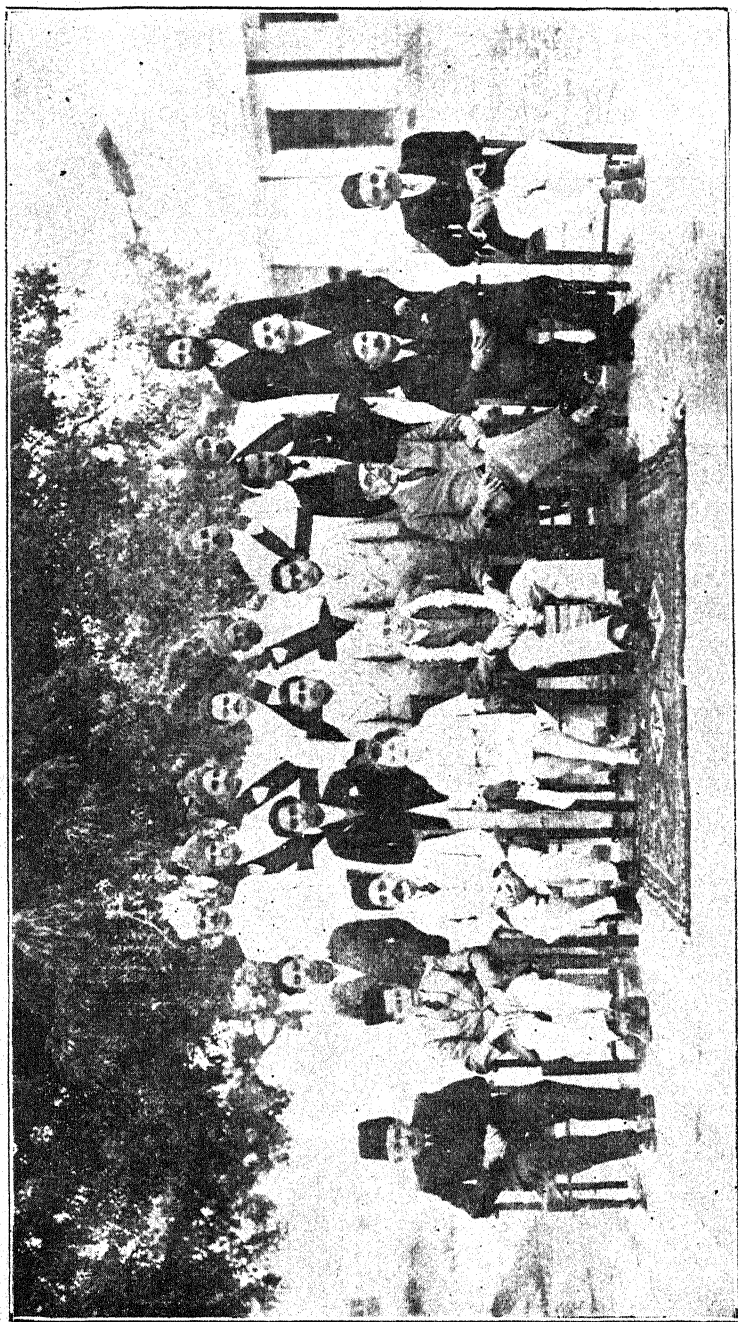
A six month's training was given to 17 men to serve as stock-men.

There has been a marked increase in the prophylactic inoculations against contagious diseases due to the large number of out-breaks, especially of R.P. & H.S. The department took over the work of control and improvement of live-stock in five districts from the agricultural department. Measures were undertaken to improve the sheep and goats of the province by importing Bikaner rams to improve the wool and by restricting the exportation of the Jumna pary goats with a view to their being used to improve the valuable indigenous breed.

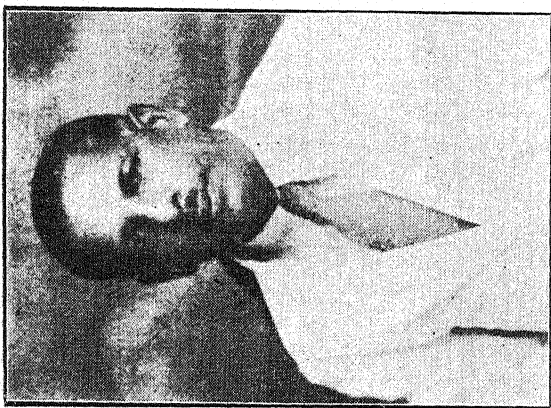
The salient points of experimental and investigational work were further attenuation of goat tissue vaccine with the chloroform vapour with a view to use it for immunising buffaloes by scarification method on the inner surface of the ear; experiments to ascertain a single minimum dose of naganol against Surra in equines; experiments in Anthrax Spore vaccine recently introduced by the I.V.R.I.; the use of sheep pox vaccine obtained from the Mysore Serum Institute and of goat-pox vaccine newly prepared at Muktesar. Experiments in intra-dermal injection against R.P. with 0.5 c. c. of goat tissue virus emulsified in 0.5% saline was undertaken. An atypical type of H.S. in suckling buffalo calves, was successfully controlled by using ordinary anti-H.S Serum.

Total receipts were Rs. 140414 (13347) and charges, Rs. 508115/- (436118).

On the whole it is clear from the report that the work done by the department was of considerable benefit to the people of the province.

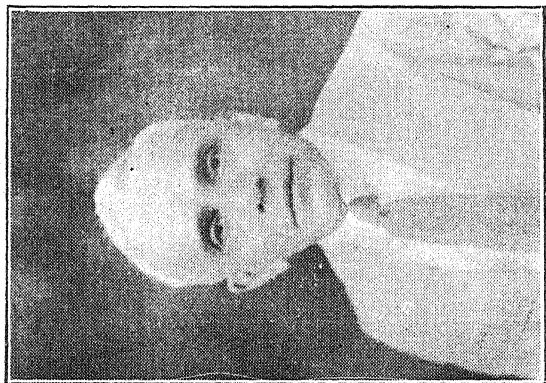


Group Photo taken on the Eve of Retirement of Mr. J. H. G. JERROM, M.R.C.V.S., I.V.S.,
Director of Veterinary Services, Sind, in January 1942.



M. V. PILLAI, G.B.V.C.,

Who has retired from Johore Veterinary
Department in January, 1942.



C. N. DESAI, G.B.V.C.,

Deputy Director of Veterinary Services,
Bombay Province, who has retired from
service on October 5, 1941.

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General Articles

A RESUME OF THE PRESENT KNOWLEDGE OF THE EFFECT OF ENDOCRINES ON THE ANIMAL REPRODUCTIVE ORGANS AND THEIR THERAPEUTIC VALUE

BY

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Endocrine therapy, regarding which comparatively little was published prior to 1890, has in recent years gained a considerable amount of popularity in the treatment of functional derangements of the reproductive organs of men and domestic animals. From the experience gained by various workers in different parts of the world on this subject, it has now been established that, in controlling the physiological function of the mammalian system, both endocrines and vitamins are absolutely essential. The endocrines are secretions of the ductless glands, called hormones, which are transported to the related organs through the blood stream, while vitamins are ingested in food.

Every mammalian system is provided with a number of ductless glands the secretions of which are circulated throughout the body, effecting the entire system. The general term for these internal secretions is "autacoids" or "hormones". They are chemical substances which have power to control, initiate or correct the activities of all the bodily organs or tissues. Sharpey Schafer (1924) (1930) divided the secretions into two different groups according to their effects. The secretions which travel over the body and stimulate the tissues or glands in distant parts are called "hormones" and the secretions which diminish activity or cause it to cease altogether are referred to as "chalones." For ordinary purpose, however,

most people use the term "hormones" for both kinds of secretions, the stimulatory and the inhibitory. These autacoids or hormones are chemical substances which are neither destroyed by heat nor altered to any extent during digestion. They retain their efficacy for a satisfactory period of life.

The advanced study of endocrinology has brought to light many valuable points regarding the functions of the hormones of the Thyroid, Supra-Renal and Pituitary glands, as well as those of the ovary and testes and their connection with the development of the body.

When all the endocrine glands are working normally there is no disturbance in sexual functions or in the building up of the body structure. In this respect they mutually influence each other to maintain the hormone equilibrium. Any pathological condition of these glands may, however, give rise to serious structural or functional disorders, resulting in the atrophy or hypertrophy of the general body structure as well as of the secondary sex organs.

Thyroid Gland

The thyroid is an important gland in early post-natal life as it is responsible for the development of the physical structure and the growth of the skeleton. It is a reddish-brown, highly vascular gland, situated at the upper extremity of the trachea or wind pipe. Usually it consists of two lobes connected by an isthmus. The lobes are enclosed in a thin capsule of fibrous tissue which extends into the substance of the gland to divide it into lobules. Each of these lobules is enclosed by a lining of epithelium and contains a quantity of thick yellowish fluid encapsulated in a vesicle. This vesicle again has a number of very minute lymphatic vessels communicating with its interior and a dense network of minute blood-vessels surrounding it.

It secretes an active principle known as "thyridin", "ido-thyrin" or "thyroxine", which exerts a powerful action on the metabolism of calcium in the body. It also stimulates the primary development of the secondary sex organs in early immature life. Any disorder in the function of this gland leads to atrophy of the genital organs and consequently retards the development of puberty. An enlargement of this gland and an excessive secretion of its active principle into the circulating blood causes exophthalmic goitre in humans while a deficiency in its secretion leads to myxoedema in adults and cretinism in the young.

The artificial administration of thyroid extract restores the balance and stimulates the general body metabolism. Formerly, the common practice was to remove this gland from an animal by sterile surgical methods and

transplant it either in whole or in part into the human being suffering from atrophy of this gland ; but later developments in endocrinology have revealed the fact that the administration of its extract by mouth or by injection has an equally good effect. This method is now used in cases of cretinism, hyperthyroidism, amenorrhoea, obesity, sluggishness during pregnancy and in certain skin diseases of animals, attended by the falling off of the hair. It is also beneficial in the treatment of the undeveloped bone and horny structure of young animals.

Supra-Renal or Adrenal Glands

The Supra-Renal glands are two small glands situated at the anterior extremities of the kidneys. Their size varies according to the age and species of the mammal concerned. These endocrine glands are remarkable for the control they exert upon the sexual development of immature individuals, even though the final responsibility for the development of puberty rests with the pituitary gland. Supra-renal tumours in children are associated with the retarded sexual development of the external genitalia and a similar condition in adult females brings about male characteristics with abnormal growth of hair on the body, amenorrhoea and finally atrophy of the essential sex organs. The active principle of these glands, which is usually known as "adrenalin" is also useful for increasing the muscular tone of the heart and the constriction of the capillaries in order to raise the blood pressure and stop haemorrhage.

The gland proper is enclosed by an outer capsule of fibrous tissue. The outer cortex of the gland is firm and reddish-brown in colour and the inner medulla is soft and yellowish and contains blood vessels. Experiments have revealed that the removal of both medullas does not interfere in the function of these glands but the removal of the cortex is always fatal within a few days of the operation, indicating that this portion of the gland is essential for life.

Pituitary Gland

Of all the endocrine glands which are related to the sex organs of mammals, the pituitary plays the most important part, as its hormone stimulates the normal function of the testes in the male and the ovary and mammary glands in the female. It is responsible for the normal development of the secondary sex organs and the sexual characteristics of the matured male and female. With the approach of puberty, it influences the growth of the seminiferous tubules and interstitial or "Leydig cells" of the male testicles, thus inducing the secretion of the male sex hormone which causes the proper development of the testicles, seminal vesicle, prostate and penis. Thereafter the male body is able to fertilize the matured ovum of the female by effective coitus. In females, it secretes three definite active principles

namely (1) a follicle-stimulating substance, (2) a luteinizing substance and (3) prolactin. The follicle-stimulating substance induces ripening of the Graafian follicle in the matured female. This in its turn produces "Oestrin" or the essential female sex hormone that brings about the development of the accessory female sex organs and induces the characteristic changes in the uterus and vagina during oestrus. The luteinizing hormone induces the rupture of the Graafian follicles in each menstrual cycle. Following this rupture an important body called the "corpus luteum" is developed to secrete an essential principle known as "Corporin", "progestin" or "Corpus luteum hormone" which prepares the endometrium of the uterus for the implantation of the fertilized ovum and produces the essential changes known as "progestational proliferation". During the period of gestation, the developing placenta secretes large quantity of oestrin which initiates the development of the substance of the mammary glands, though the actual formation of the ducts and lobules and the secretion of milk, starting during the advanced stages of pregnancy or shortly after the birth of the foetus, are due to the influence of prolactin.

This ductless gland, which is also known as the "hypophysis cerebri", is a small bean-shaped body, situated in the upper surface of the sella turcica or the hypophyseal fossa of the sphenoid-bone in higher mammals and has three distinct divisions, anterior, middle and posterior. The anterior lobe is composed of columns of epithelial cells and active glandular and highly vascular tissue and its secretion is responsible for the normal development of the body and sex characteristics. The middle lobe is a narrow band of non-vascular epithelium and its direct action on the system is not yet thoroughly understood. The posterior lobe consists of nervous tissue with less blood supply and it secretes a hormone which has a direct action on the reproductive organs. Nothing is known about the existence of lymphatics in the pituitary body.

Removal of the pituitary gland or its inactivation causes infantilism with atrophy of the sex organs and disturbances in the metabolic function and natural growth of the body which result in adiposity. Implantation of the gland restores perfect health and the full vigour and strength of the sex and other organs related to the gland. In normal conditions, the anterior pituitary hormone builds up the body by formation of the long bones and regulates the metabolism of protein, fat, carbo-hydrates, water and calcium. Its stimulating effect upon the sex organs and mind of the adult is very marked. It also produces maturation of the sex organs and is responsible for natural sexual libido. In addition, its hormone induces ovulation and lactation in the female and spermatogenesis in the male. It induces fertility, luteinization, rhythmic contraction of the uterus to evacuate its contents during oestrus and delivery. The posterior lobe secretes "pitressin" or

"puitritin" and "pitocin" or "oxytocin". The former hormone causes an increase in the arterial blood pressure and regulates the secretion of urine by direct action on the kidneys and the latter causes oxytocic stimulation on the gravid or non-gravid uterine musculature.

The hormone of the pituitary body was first identified by Smith and Engle (1927) and subsequently numerous workers have demonstrated its appearance in the blood, cerebrospinal fluid and urine during oestrus and pregnancy. The blood and urine of pregnant women and the blood-serum of pregnant mares are very rich in gonadotropic or anterior pituitary hormone between the 45th and 200th days of gestation and urine and serum collected during this period are extensively used for the detection of pregnancy in women and mares and for the treatment of sexually debilitated males and females.

Anterior Pituitary Hormone

Syn :—Gonad Stimulating Hormone, Prolan "A" and "B"

Antuitrin—S, Follutin, Follicle-stimulating, luteinizing etc.

Anterior Pituitary hormone consists of two main principles namely Prolan "A" and Prolan "B". Prolan "A" brings about maturation of the Graafian follicles, ovulation and oestrus and prolان "B" converts the follicles into Corpus Luteum, inhibits the production of oestrin during gestation and stimulates the function of "Progestin" in the female. In the male, Prolan "A" acts on the semeniferous tubules and stimulates spermatogenesis, while Prolan "B" stimulates the interstitial cells causing the development of the testes and penis and induces erection and sexual libido. The urine of pregnant women is very rich in Prolan "B". A combined course of treatment with Prolan "A" and "B" is indicated in cases of functional disorders of the genitalia and sterility and impotency in male and female animals.

In cases of cryptorchidism and mal-development of the sex organs, a regular course of treatment with anterior pituitary hormone, which is available in the urine of pregnant women and the blood-serum of pregnant mares, has caused the testicles to descend to their normal position with marked developement of the gland itself as a result of tubular growth and increase in the interstitial cells. Schapiro (1930), Engle (1932), Kunstadter and Robbins (1934) in the course of their experiments upon and treatment of human patients, succeeded in producing most of the essential adult sex characteristics, including development of the testes, enlargement and proper erection of the penis and regular emission of semen with formation of effective and actively motile spermatozoa. Spence and Scowen (1935) reported the result of their clinical observations upon and successful treatment of cases of mal-development of the genitalia with anterior pituitary hormone therapy.

Gordon (1936) remarked, after a review of the records of 521 boys suffering from cryptorchidism, that this condition is a symptom of thyro-pituitary-gonad disturbance and suggested that no boy should be subjected to an operation for undescended testicles until he has been given the benefit of organotherapy for atleast six months. The injection of anterior pituitary hormone (antuitrin-S) at the rate of 100-200 R. U. (1 or 2 c. c.) two or three times a week should be continued for about two months. This should accelerate puberty and gradually cause the testicles to descend. This treatment was also shown to be of value in cases of infantilism and the mal-development of the sex organs in both the sexes.

Brown (1936) and Cramer (1937) treated a number of boys who had cryptorchidism and marked atrophy of the genitalia. The boys were extremely fat over the hips and pubis but had no pubic hair. After a course of injection with 1 c. c. of anterior pituitary hormone (Antuitrin-S) on alternate days for five weeks, the external genitalia assumed their normal size and the testes descended into the scrotal sac with a reduction of the fat.

Dorff (1936) reported his success in the treatment of undeveloped genitalia and metabolic deficiency with gonadotropic hormone from the urine of pregnant women. He treated successfully with Antuitrin-S a number of cases of adiposogenital dystrophy, of mal-development of the testes and of delayed puberty. The doses given were 1 or 2 c. c. and two or three times a week from two to six months.

Dawsan (1932), Anspach and Hoffman (1933), Shaw (1933), Hamblen (1935) and Hutton (1936) obtained good results from anterior pituitary hormone therapy in menstrual disorders of various types. Some of these workers advocate the use in addition to oestrogenic hormone. The injection of 1 c. c. of anterior pituitary hormone should be continued for from 3 to 5 days or 2 c. c. on alternate days for one week. This should be followed by 2,000 international units of oestrogenic hormone (Theelin) on every alternate day for from 2 to 3 weeks, followed by a period of rest for 7-10 days (this resting period may be the menstrual period). The treatment should then be repeated and continued for at least three months.

Krishna Iyer (1936) carried out experiments on small animals with gonadotropic hormone. He observed marked development of the sex organs and increased sexual excitement in most of his experimental animals as a result of the injection of detoxicated urine from pregnant women.

Puberty

During puberty, the body attains sexual maturity and becomes capable of propagating its species. Its appearance in mammals causes drastic changes throughout the whole body and even affects the mind. The entire

system of so called sexless individuals becomes sexually matured at puberty. In animals, this condition of sexual life generally lasts till the end of their life, since the majority of them do not survive to die a natural death in extreme old age.

At puberty, all male individuals assume the natural appearance of masculinity and the temperament of their specific species and their sex organs develop. The testes become capable of elaborating large quantities of semen with actively motile and effective spermatozoa. During this period, their accessory sexual glands also start to secrete the medium by which sperms are nourished. At puberty the external and internal reproductive organs of females become fully developed and so distended that they are able to bear the physical strain of coitus and parturition, the uterus becomes capable of conception, the ovaries fully matured to discharge ripe ova and the mammary glands become distended with their lactiferous tubules and so are capable of manufacturing milk for the young. At this period, females first ovulate. This is preceded or followed by oestrus, which is repeated at regular intervals for the rest of their sexual life. Domesticated male animals, after attainment of puberty, are usually fit to propagate at all seasons unless they are made pathologically disabled.

Puberty may be hastened or delayed by nutritional, climatic and other factors. At this period of life, as a result of the stimulation received from the secretion of the anterior pituitary gland, male animals become capable of fertilizing the female and the female acquires all the requisite physical characteristics necessary to conceive and carry the foetus till the date of delivery. Normally, the development of the secondary sex organs in the male is slower than in the female.

In cases of delayed puberty and mal-development of the testes and other sex organs in the male and of the ovary, uterus and mammary glands in the female, implantation of pituitary tissue or injection of its extract restores normal development.

The following table will show the different periods of mammalian life after attainment of puberty :—

Species.	Average life.	Puberty in male.	Puberty in female.	Oestrous period.	Normal recurrence of oestrus.	Gestation period.	Reappearance of oestrus after delivery.
Man	70 years	18-20 years	12-14 years	3-4 days	28 days	270-280 days	45-60 days
Elephant	150 "	50 "	30 "	3-4 "	12-18 months	2 years	18-24 months
Horse	30 "	5 "	18-24 months	5-7 "	2-3 weeks	335-345 days	7-10 days
Cattle	25 "	3 "	18-24 "	2-4 "	3-4 "	275-285 "	21-28 days
Sheep	15 "	12-18 months	8-12 "	1-2 "	17-20 days	149-151 "	4-6 months
Goat	15 "	12-18 "	8-12 "	1-2 "	17-20 "	149-151 "	4-6 "
Pig	10 "	18-24 "	6-8 "	2-4 "	20-21 "	112-121 "	5-6 weeks
Dog	12 "	18 "	7-10 "	1-3 weeks	5-6 months	58-65 "	5-6 months
Cat	10 "	12-18 "	8-12 "	1-3 "	2-3 weeks	55-63 "	5-6 "
Rabbit	5 "	6 "	4-6 "	1-2 days	15-17 days	30-32 "	5-6 days
Guinea-pig	5 "	6 "	3-5 "	24 hours	15-17 "	63 "	1-5 "
Mice	28 months	2 "	6-7 weeks	5-6 days	15-21 "	19 "	5-6 "

Testes.

In males, the next essential sexual glands to the pituitary are the testes, which lie in the scrotal sac of the majority of the animals with the epididymis and its associated structures. In elephants and some other wild animals, these organs remain in the abdominal cavity between periods of sexual activity.

The testes are composed of a dense fibrous coat known as "tunica albuginea" wherein lies a collection of tubular structures known as "seminiferous tubules", surrounded by epithelial cells. The tubular structures are separated by septa of loose connective tissue which contain the blood and lymph vessels and nerves. These septa hold the scattered interstitial cells known as "Leydig's cell". The seminiferous tubules are connected with each other near the central position of the testes and communicate with the epididymis or the reservoir of sperms to form the "vas deferens", which itself terminates in the urethra. Along the course of the urethra the ducts of the prostate, the bulbo-urethral glands etc., open to pour out their secretion to nourish the manufactured sperms and lubricate the penis during coitus. The most important function of this organ is to manufacture spermatozoa or male germ cells. Normally this manufacturing process (spermatogenesis) is continuous in sexually developed healthy males during active sexual life.

The physiological function of spermatogenesis is entirely governed by the secretion of the anterior pituitary gland and this in return, by virtue of its secretion, stimulates the other secondary sex organs bringing about the normal erection of the penis, sexual libido and the sex characteristics of the male.

Spermatogenesis

With the appearance of puberty in the male, the seminiferous tubules start manufacturing effective spermatozoa. This is called spermatogenesis and continues during active sexual life. With the advancement of age, sexual tendencies decrease as a result of the increase of stroma and the atrophy of the parenchyma by gradual transformation of the tubules into hyalin discs. These atrophic changes may occur in young males as a result of debilitation caused by pituitary deficiency, excessive sexual indulgence, masturbation, tuberculosis and other wasting diseases.

The sperms are produced in the parenchyma and are protected by interstitial cells, "Leydig's cells". For the proper germination of effective sperms, the testicles are enclosed in the scrotal sac which regulates the temperature. Excessive heat or cold interferes with the germination process and it is for this reason that spermatogenesis does not occur in

undescended testicles, though a sexual libido may be manifested by the stimulation of the testicular or male sex hormone which is secreted in the testes by the influence of the gonadotropic hormone on adult males.

The seminiferous tubules of the testes are lined by several layers of epithelial cells which constantly multiply and mature to form spermatozoa in the testes. This occurs as a result of the stimulation produced by the hormone of the anterior pituitary gland. These spermatozoa are nourished and matured in the Sertoli cells and finally appear in the fluid of the testicles and epididymis. Sperms are not motile until they come into contact with the secretion of the vesiculi seminalis and prostate glands. They are inert in the testicles and epididymis. Their number is always reduced after several successive coitions or emmissions but they soon regain their normal number after a period of rest.

Donham and Simms (1931) carried out an experiment on 201 bulls to ascertain the normal and abnormal conditions of the reproductive organs. They found actively motile spermatozoa throughout the whole length of the genital tract in sexually matured bulls and considered the ampulla of the ductus deferens to be the best site for the collection of semen for examination. In a well balanced endocrine condition of the testes, the semen is very rich in active motile spermatozoa and the contents of the ampulla appear to be a slightly cream-coloured, thick, tenacious fluid. In less balanced conditions the number of spermatozoa is considerably smaller and the contents are of a clear, thin, watery consistence.

Vesiculi Seminalis.

The Vesiculi Seminalis are two sacs situated at the base of the bladder, serving as reservoir of the semen. These glands are rudimentary in immature males but, with the attainment of puberty, they develop to function on stimulation by the gonadotropic hormone. At full maturity, they reach their maximum size. With the exception of dogs, cats and rabbits, the majority of mammalian males are provided with these sacs for storing the seminal fluid.

After the spermatozoa are formed in the testes, the testicular fluid carries them into these sacs. These sacs also are provided with minute glands which secrete a yellowish-white fluid. This secretion, when combined with that from the testes and the suspended sperms therein, forms the active seminal fluid.

Prostate Gland.

The Prostate gland is a body situated around the neck of the bladder and the beginning of the abdominal urethra. Its development is influenced by the anterior pituitary hormone during puberty. It consists of two

lateral lobes and a middle lobe and is composed of muscular and glandular tissues under a capsule. In some animals, it extends to a certain portion of the lower surface of the urethra. It has two passages, one on either side of the ejaculatory duct, through which its secretion reaches the urethra. Its secretion is a slimy, turbid fluid of a peculiar odour, which serves a very important function in developing and nourishing the spermatozoa. Normal spermatozoa are very susceptible to acids, though in the course of their own activities they form large quantity of carbon dioxide, which would prove fatal to them, were it not that the secretion of the prostate is capable of absorbing this carbon dioxide, thereby maintaining the life and vigour of the spermatozoa.

Prostatic secretion becomes more abundant as a result of sexual excitement. It acts as a lubricant for the easy introduction of the male organ into the vagina during the process of coition. The prostate of individuals who indulge in frequent and excessive sexual activities, becomes abnormally enlarged and this, in its turn, leads to increased sexual desire.

Testicular or Male Hormone.

The hormone which is secreted by the testes in the course of spermatogenesis, as a result of stimulation by the anterior pituitary secretion, is called the male hormone" or "testicular hormone". This is responsible for male characteristics in healthy adults and is closely related chemically to oestrin or the female sex hormone. It has been demonstrated definitely that castration of sexually immature male animals results in substantial changes in the nature of the animals so treated, their secondary sex organs do not develop and they remain entirely indifferent to sexual intercourse. The effect of castration may vary according to the age at which it is performed. The castration of fully matured animals may not produce marked changes in general appearance and the penis may retain its capacity for erection, while being unable to complete coitus. From this experimental data, it may easily be concluded that besides spermatogenesis, the testes has some other functions to perform in connection with the sexual life of a male *i.e.*, the development of male sex character and sex organs as result of the secretion of the male sex hormone or testicular hormone.

As a result of a deficiency of male hormone, serious conditions such as eunuchoidism, cryptorchidism, failure in spermatogenesis and partial or complete impotency may ensue. In all such conditions, deficiency may be of either the testicular or the pituitary hormone or of both. Kenneth and Walker (1937) advocate treatment of such conditions with combined pituitary and testicular hormone. They recommend long continued treatment with large doses for cases of extreme sexual debility. Injections of fresh testicular tissue emulsion have been found to be beneficial even in cases of very advanced impotency.

Saterlee (1928) describes the beneficial effect of subcutaneous injections of macerated sheep testicles in the treatment of men and women and as a result of that treatment he noticed general improvement in physical condition, improvement in urinary glucose in the diabetic, increase in body vigour, augmentation of the cutaneous and intestinal circulation and improvement in the blood picture of his patients.

Butenandt (1931) first isolated the male sex hormone in pure crystalline form from human urine. He obtained 15 mgs. of this hormone from 25 litres of urine and named it as "Androsterone". This hormone is now being used extensively in medical and veterinary practice. It can be obtained from the urine of all sexually matured healthy men and animals, more particularly from stallions.

David (1935) isolated testosterone from the testicles of matured bulls.

In the treatment of animals, injection of freshly collected detoxicated urine has been found to be safe and efficacious. Urine from sexually matured healthy male animals, preferably from stallions, should be collected with all possible sterile precautions and each 100 c. c. of urine should be detoxicated with 4 grammes of sulphosalicylic acid. After filtration through filter paper, it should be neutralized by the gradual addition of small quantities of sodium bicarbonate till it ceases to froth. This neutralized urine should again be filtered and injected fresh in doses of 40 to 50 c. c. twice a week until six injections have been given. This treated urine inhibits all bacterial contaminants, precipitates proteins and becomes non-toxic when injected to animals. If no improvement is observed after this course of treatment, the course may be repeated two, three or four times at intervals of a fortnight. The author found that injections of stallion's urine into indifferent and partially impotent stud bulls gave very encouraging results.

Heart and Cole (1936) stimulated the sexual activities of impotent male animals by injections of gonadotropic hormone from the urine of pregnant women and the blood serum of pregnant mares. They obtained very satisfactory results in the treatment of impotent stallions, bulls, and boars and recommended 1,500 R. U. of the commercial gonadstimulating hormone for horses and bulls and 200 to 500 R. U. for sheep and boars.

Laqueur and his associates succeeded in isolating the male hormone from the testes itself and they named the product "Testosterone". In veterinary practice, an emulsion of the fresh testicles of goats, sheep, swine, stallions, bulls etc., may be injected with safety and may easily be obtainable from the slaughter houses or by destruction of animals immediately before injection. The testicles may also be surgically removed from a

living animal with strict aseptical measures and they may be macerated in N. S. S. with sterile sand in a sterile mortar. The supernatant fluid of the emulsion should be injected subcutaneously in doses of 30 to 40 c. c. for fairly large adult animals at an interval of three days, till six such injections have been given. It may be necessary to repeat this course of treatment after an interval of two weeks. There are various reliable commercial preparations of these hormones available from Messrs. Parke, Davis and Co., but for ordinary purposes, fresh gland emulsion may be used with perfect safety and confidence. The oral administration of hormones has been shown to have very little value in veterinary practice, as the hormones are rendered biologically inactive when they come into contact with the gastric and intestinal juices.

Venzmer (1937) obtained very good results by the implantation of monkey's testicles and the injection of testicular hormone into aged and impotent persons.

Zuckerman and Parker (1938) demonstrated that, as result of castration, the fur of the male hamadryas baboon changed from its natural grey colour to the greenish-brown, which is characteristic of the female of the species. He was able again to bring back the natural colour of the fur by the injection of "testosterone". These workers observed that as result of these injections the internal reproductive organs, which usually become atrophied after castration, regain their normal functional character and proper development. They could also produce flushing of the sexual skin, natural to sexually matured males and a remarkable enlargement of the external genitalia in immature Rhesus monkeys by the injection into them of testicular hormone.

When the testicles are diseased or surgically removed and the testicular function is lost, males, assume a character similar to that of the females of their particular species. Under such conditions, Voronoff's and Steinach's operations have been found beneficial in rejuvenating both men and animals for at least a considerable period. Voronoff's method is to implant or graft pieces of testes, surgically removed from a young, healthy and vigorous individual, on the tunica vaginalis of the old and decrepit male and thereby provide the graft in the position of the testis in the scrotum. His technique lies in removing a testes from the donor in an aseptic measure and insert one or more of its pieces into the patient's gland after making small surgical opening into the scrotum. He emphasises that the donor and the recipient should be as near akin as possible and he therefore preferred to select young healthy monkeys or chimpanzees or cynocephalies as donors for human beings. After successful grafting, most of the senile symptoms disappear and the individual becomes sexually rejuvenated as a result of the repair of the failing process of the gland. It has been noticed that this operation

renews the muscular, mental and sexual activities of such rejuvenated individuals.

In Steinach's method, ligatures are made in the seminal ducts of the male to induce atrophy of the testicular cells and so increase the activity of the interstitial cells. His first experiments were in grafting testicular tissues into the abdominal muscles of extremely senile rats. The results obtained proving quite satisfactory, the same procedure was followed for other animals with similar encouraging results. He was however unable to adopt this procedure in human practice for want of suitable testes from human donors. Consequently he tried ligaturing the seminal ducts and obtained equally good results. His present technique of operation is to block the vas deferens to curtail the excretory function of the testes. This vaso-ligature performs a double function; firstly it cuts off the connection between the testes, prostate and vas deferens and stops the production of sperm-cells as a result of the inevitable degeneration of the seminiferous tubules and secondly it brings about hyperplasia in the interstitial tissues of the testes causing them to work more actively. The increase in the interstitial tissue is associated with an increased output of testicular hormone which ultimately when circulated into the system acts as an agent of rejuvenation.

Ovary

The next important endocrine gland to the pituitary body in the female is the ovary which, like the testicle of the male, is chiefly concerned in the manufacture of the female germ-cells from which the foetus is developed. These are two almond-shaped solid bodies, situated on either side of the pelvic cavity, closely attached to the wall by the ovario-pelvic fold. The ovarian ligament, stretching from the lower pole, attaches them to the cornu of the uterus at a point below and behind the entrance of the Fallopian tube by the long fimbria known as the "fimbria ovarica." The ovaries are composed of spindle-shaped cells consisting chiefly of connective tissue and stroma. They are covered by a layer of small columnar cells which represent the embryonic germinal epithelium. Graafian follicles containing ova of varying sizes, are embedded throughout the stroma at different depths. Each of them is surrounded by a capsule and a layer of epithelium. Some of these cells are comparatively larger than others, indicating early maturity. With the development of the ovum, a quantity of fluid known as "liquor folliculi" accumulates between the layers of epithelium and finally, as a result of its gradual increase and the development of the cell, the follicle reaches the surface of the ovary and projects from it. This is the matured stage of the ovum which is soon ruptured and discharged with the liquor folliculi. It is received by the fimbriated end of the Fallopian tube and

gradually carried down into the uterus. This is the general process of ovulation in healthy, matured females following oestrus.

The inner medullary portion is very rich in blood vessels, nerves, ganglion cells and stroma and the outer cortical portion is mostly composed of ovarian follicles and stroma. The ovaries vary in size according to the species, age and size of the individual. They are about the size of a bean in women, an almond in mares and cows and smaller still in most other animals. In mares, each ovary possesses a groove known as the "ovulation fossa" through which the ripe ova escape. This is absent in women and very indistinct in other animals.

The process of ovogenesis in adult females is continuous just as is that of spermatogenesis in males. The removal of the ovary from the female leads to complete barrenness and inhibits the growth and development of the secondary sex organs and characteristics, just as does the removal of the testes in the male. These bodies of the female system are analogous to the testicles of the male, their ovum to the spermatozoon and the liquor folliculi to the seminal fluid.

The entire activity of the ovary in matured females is governed by the secretion of the anterior pituitary lobe and to a certain extent by the ovary itself. Anterior pituitary stimulation brings about ovulation in the ovary and as a result of ovulation the ovarian hormone is secreted. This produces oestrus and the characteristic changes in the female secondary sex organs and mind. Smith and Engle definitely proved this fact by the implantation of the anterior pituitary tissue and ovarian extract from matured females into undeveloped and sexually immature females. As result of this, a rapid development of the sex organs, an early maturity, the manifestation of sexual characteristics and certain mental changes with sexual libido appeared in these immature females. The activity of the ovary and the anterior pituitary lobe in females are inter-related and, as a result of this, they regulate each other's action by their respective secretions.

Ovulation

As a result of stimulation produced by the anterior pituitary hormone, ovulation takes place soon after the follicles are completely ripe in the ovary. In most large animals, ovulation is spontaneous though this is not the case in cats, rabbits and a few other small animals, in which ovulation occurs only after coitus.

Mammals as a rule manifest a definite follicular cycle involving follicles of all sizes in the ovary. The life of the egg cells is shorter than that of the other body cells. New ova are formed with every succeeding cycle, particularly during metoestrus and ano-estrus. During metoestrus, the ovaries

and their follicles are very small but with the approach of a new cycle they increase in size.

Among domesticated animals, mares have the largest ovarian follicles and generally ovulation of one or two of their ova takes place during the latter part of oestrus as a result of the rupture of the follicles, while the rest of the follicles quickly recede and disappear. In cows, ovarian follicles attain their maximum size after the tenth day of their oestrous cycle and ovulation takes place from one or two follicles on the last day of heat or the day following, while the unruptured follicles are soon reabsorbed as usual. In the sow, ovulation generally takes place on the second day of oestrus and about fifteen to twentyfive ova are discharged at a time. In sheep and goat, the process and nature of ovulation are the same as in cows but on each occasion one to five follicles are ruptured and the rest reabsorbed. In bitches, ovulation takes place on the first or second day of oestrus and the number of ova liberated each time varies with the size and breed.

Usually ovulation does not occur during pregnancy though records of such ovulation are available in cases of mares. In some animals, ovulation takes place immediately after parturition and this prevents the oestrous cycle appearing till the period of lactation is over.

Corpus luteum

Soon after ovulation, the ruptured follicle-walls are transformed into lutein bodies which are then called "corpus luteum". These are temporary highly vascular endocrine glands formed under the influence of the anterior pituitary secretion and secrete a very important hormone known as "Progestin" (corporin, leutin, progesterone) which is most essential in early pregnancy to inhibit the contraction of the uterine muscles and the ejection of the fertilized ova. Progestin works antagonistically to the action of the pituitary hormone and maintains sexual calm in domestic animals during the period of pregnancy. The action of Progestin is not very evident in women, particularly during the earlier months of pregnancy as manifestations of sexual desire during this time are common. A failure on the part of the corpus luteum to function results in immediate abortion, followed by the appearance of oestrus.

Uterus

The uterus is the most important female sex organ of generation. It is in this organ that the female-sex-hormone (oestrogenic hormone) first acts to produce oestrus and subsequently to hold and nourish the fertilized ovum until it is matured and delivered.

It is a hollow elastic "Y" shaped organ, which opens at the posterior end of the vagina, known as "os uteri". It is composed of thick muscular

walls lined internally by mucous membrane continuous with that of the vagina. This mucous membrane is very rich in minute mucous glands and consists of a surface of columnar ciliated epithelium, glands and stroma. The glands are of a simple tubular type and secrete a thin, alkaline fluid. The outer surface of the uterus is covered by the peritoneum and the whole organ is suspended in the pelvic cavity by broad ligaments. In old age, it shrinks consequent upon atrophy of the muscular walls and is replaced by fibrous tissues. The mucous membrane or endometrium of the uterus and vagina are continually undergoing changes during the sexual life of the female owing to the effect of the ovarian or oestrogenic hormone.

For the purpose of procreation, nature provides a period in the cycle of female life known as the oestrous period when her reproductive organs attain suitable conditions to receive male-germ cells and to allow their union with the ripe ova to form the nucleus of the future embryo. Physiologically this phenomenon is brought about by coitus with a male of the same species. The male introduces semen with active spermatozoa directly into the uterus, or near about its cervix in the vagina, and thus the two germ-cells unite and fecundate.

Birth from a virgin (parthenogenesis) is not possible in vertebrates. Reproduction is the result of a number of processes in which both the male and female generative organs must participate. The matured ova (or the female germ-cell) should meet the spermatozoa (or the male germ cell) under such suitable conditions of the uterus that the latter's endometrium is in a position to embed the united cells into its body to develop into a foetus. To ensure this process, the female reproductive organs must be in perfect physiological condition, with no physical or organic impediment to coitus, conception, gestation and delivery of the foetus at the right time. Artificial insemination may render unnecessary the primary process of coitus but the rest of the processes must be fulfilled if young are to be produced.

The ova flushed out as a result of the rupture of the Graafian follicles, are received by the fimbriated extremity of the Fallopian tube and gradually carried to the uterus by the lashing movement of the ciliated epithelium of the tube. Ordinarily if copulation takes place early and semen is deposited into the uterus or vagina, the spermatozoa wriggle up into the Fallopian tube to meet the matured ovum. In the case of delayed copulation, the ovum descends into the uterus and the union of sperm and ovum takes place in the uterus. Immediately upon the entrance of a spermatozoon into an ovum, the wall of the ovum becomes impervious to the penetration of other spermatozoa. The spermatozoon, after its entrance, loses its tail and becomes fixed in the cytoplasm of the ovum. The head piece of the sperm contains the cell with its nucleus and chromosomes, while the middle part contains the centrosome. The ovum contains cytoplasm and nucleus but

no centrosome. As a result of the union of the male nucleus of the spermatozoon and the female nucleus of the ovum, the process of cell division starts and, after formation of the segmentation nucleus and certain more essential transformations in the uterus, the nucleus of the future embryo is formed. In most mammals, the embryo, for certain period of its embryonic life possesses the rudiments of both the male and female genital organs but at a later date one set of sex organs predominates and the other degenerates. This fact is proved by the vestiges of these organs in the form of the clitoris in females and the nipples in males.

Oestrus

All healthy matured female mammals have a regular oestrous cycle accompanied by sexual excitement and changes in the genital organs as a result of the rupture of the Graafian follicles and the secretion of the ovarian hormone. The general phenomena in this condition are much the same in all females, except for variations in the period of the cycle and the length of its different stages. Human females evince more sexual excitement a week before and a week after the menstrual period. Female animals, which are quite docile and timid at other times, become restless, excitable and easily irritated during oestrus. Most animals manifest uncontrolled sexual desire at this period. If they are not served at this time, the oestrous signs gradually disappear and the animals return to their normal state of sexual calmness and remain so till the next oestrus.

According to Heape female mammals are divided into two distinct groups *viz.* "Monoestrus" and "Polyoestrus". Monoestrus females are those that have only one oestrous cycle annually, while polyoestrus females have a series of oestrous cycles during the course of a year. This cycle may again be divided into three stages: (1) The "anoestrous stage" or the period when the genital organs are at rest; during this period the uterus and Fallopian tubes are small and the formation of Graafian follicles in the ovary is delayed. (2) The second stage is called the "prooestrous stage" or the period of rapid ripening of one or more Graafian follicles and the congestion and swelling of the Fallopian tubes. During this period, all females show similar congestion and haemorrhage in the uterine and vaginal mucous membranes, as a result of the engorgement and rupture of the capillary blood vessels. This extravasated blood, together with the glandular secretion of the uterus and the epithelial debris, issues as a blood-stained mucous discharge through the vagina. The quantity of blood in the flow of animals is much less than in that of women. Indeed, it is sometimes so scanty that it appears as little more than an ordinary, whitish, mucous discharges. On account of the discharge of Graafian follicles and the formation of Corpus luteum, the uterine endometrium becomes

hyperaemic and hypertrophied, thus inducing an effusion of blood from the ruptured capillaries. This causes the uterine endometrium to undergo a partial necrosis and small portions of the necrosed tissues are cast off with the effused blood and the secretion of the uterine glands. The normal oestrous flow thus differs considerably from the circulating blood. The characteristic of a normal healthy flow is that it is very rich in calcium salts which usually prevent it from clotting. (3) The third stage is the "Oestrous stage" or the period of excessive sexual excitement and earnest craving for sexual intercourse, owing to the shedding of the ovum from the ruptured Graafian follicle. In human females and in monkeys, these stages are not well defined as these animals possess a very indistinct period of sexual calmness but in other animals, there being a definite period of sexual intercourse, these different stages of the oestrous cycle are marked. In animals, if conception does not take place the sexual excitement passes off and the female relapses into complete sexual calmness. This stage of complete calmness or freedom from sexual excitement is known as "anoestrus." It lasts for varied periods according to the species of the animal concerned.

Human females and monkeys are polyoestrous and as such, unless they are pregnant exhibit a series of oestrous cycles in the course of a year. Other domestic animals such as mares, cows, buffaloes, sheep, goats, pigs, dogs and cats, were in their primitive stage, monoestrous like other wild animals but as a result of better feeding and living conditions, they have now turned polyoestrous. In fact all animals in their original wild stage have only one breeding season but in captivity, they acquire the characteristics of polyoestrous mammals.

Every normal matured female animal has a definite period of heat or sexual lust, associated with the signs of oestrus, which is induced by the effect of the ovarian hormone. It is only during this period that the female animal will receive the male and at this stage of the female life, a mucous or muco-sanguineous discharge issues from the genital passage while there is appreciable congestion and swelling of the uterine and vaginal mucous membrane and external genitalia. A deficiency in ovarian hormone or the disfunction of the ovary itself may lead to a total suppression or a continuation of these oestrous signs, rendering the uterus temporarily or permanently incapable of holding the fertilized ova. This condition may effectively be cured by the injection of ovarian hormone obtained in crude form in the urine of pregnant animals or of oestrogenic hormone products available in commercial form.

Mammary Glands

The Mammary glands are composed of lobes consisting of collections of minute convoluted tubules terminating in bigger tubules known as "lactiferous tubules". These tubules are kept in apposition by means of connective

tissue under a layer of fat. The main tubules open at separate orifices at the nipple or teat. Just before these tubules enter into the nipple, they become dilated to form cavities or reservoirs to allow the milk to be accumulated during active secretion. The outer walls of these tubules are lined by areolar and some unstriped muscular tissues and the internal walls by short columnar. The nipples are vascular and erectile in nature. The whole of the mammary gland has an abundant supply of blood vessels, nerves and lymphatics. The glands and their internal blood-vessels behave like other erectile structures during sexual excitement and become swollen and partially erected at this time.

With the advance of pregnancy, the mammary glands become gradually enlarged and hardened as a result of the increased activity of their blood-vessels, which leads to a great distention of the milk ducts. This condition persists throughout the whole of the lactation period and gradually returns to normal with the decrease of the milk secretion.

The development of the mammary gland at the time of puberty is primarily brought about by the influence of the anterior pituitary hormone and the gland is subsequently nourished by the ovarian and corpus luteum hormones. The secretion of milk in these glands is stimulated by the anterior pituitary hormone, which is known as "Prolactin". To reestablish the proper development of the mammary glands and the secretion of milk, combined injections of anterior pituitary and ovarian hormones are indicated.

Ovarian Hormone

The most important hormone secreted by the ovary of the female is the oestrogenic hormone, commercially known as ovarian hormone, theelin, theelol, amniotin, emmenin, folliculin, etc. This hormone brings about characteristic sexual changes associated with oestrus in the genitalia of mature females. This is secreted by the ovary in the developing follicles causing enlargement of the uterus, thickening of the endometrium as result of cell enlargement and proliferation, marked rhythmic contraction of the muscular coat of the uterus, secretion of mucus from the cervix and those characteristic changes in the epithelial cells of the vaginal mucous membrane, which are known as keratinisation or cornification. During normal oestrus, ripened Graafian follicles secrete oestrin which causes bleeding from the uterus and influences the proliferation of the endometrium. Soon after ovulation, the ovarian secretion of oestrin diminishes. At this stage the corpus luteum commences to secrete progesterin and renders the endometrium almost free from oestrin. During this time, a high concentration of oestrin is passed in the urine of pregnant animals. Oestrin brings about signs of oestrus in the secondary sex organs (*e.g.* in the vaginal epithelium) but does not react upon the ovary itself to produce ovulation. It is

for this reason that ovariectomised mice are extensively used for the detection of pregnancy in women and mares.

To induce fertilization in functionally disordered females, the administration of anterior pituitary hormone, combined with ovarian hormone, is indicated. Heart and Cole (1936) induced follicle maturation, ovulation and oestrus in ewes by 3 or 4 injections of 100 to 500 R. U. of anterior pituitary hormone and as a result of this treatment the majority of cases became pregnant within a short time. This process is very useful for breeders, as they can bring many female animals into heat at a time and by the process of artificial insemination can impregnate them from a single service. For mares and cows 750 R. U. of this hormone for ewes and sows 100 to 250 R. U. may be used with extremely satisfactory results. Overstimulation or over-dosing of the female produces excessive ovarian activity which is not desirable.

Oestrogenic or ovarian hormone has been used to cure all forms of oestral disorders. From animal experiments and clinical observation at this Institute as well as in other places, it has been observed that oestrogenic hormone promotes and enhances the growth of the uterus, vagina and mammary glands and brings about oestrus and early maturity in females. The injection of oestrin induces signs of oestrus in females, even when cyclic changes in the ovaries and secondary sex organs have been completely absent for sometime during lactation. This can also bring about menstruation in elderly females who have ceased to menstruate but this effect is not permanent. It is now a definitely established fact that an under-developed uterus can be rendered normal by subcutaneous injections of large doses of oestrogenic hormone. Intravenous injections of aqueous solutions of crystalline hormone products may be adopted but subcutaneous injections are more effective in these cases on account of their slower absorption by extra vascular sites. Oral administration is not so effective as injection as it requires much larger doses (20 to 100 times) to obtain the desired effect. Hill (1937) claims that ovaries in addition to oestrogenic hormone, secrete male hormone just like that of the testicle. He was able to produce normal growth and secretion from the seminal vesicles and prostate in several castrated mice by grafting ovaries into their ears, though Cameron and Moore (1937) observed that the injection of Keto-hydroxy-oestrin into adult males produced testicular degeneration and injections into immature males definitely inhibited normal gonadal growth and maintained the testes in an infantile condition.

Frei and Kolb (1924) demonstrated the effect of ovarian implantation on a senile goat 14 year old with an atrophied, non-secreting udder. The goat had not come into heat for three years. They slaughtered a three months old nanny goat and immediately inserted two pieces of ovarian

tissue intra-muscularly in the region of the croup, one piece subcutaneously and four pieces intraperitoneally. Within a period of one month, both quarters of the udder developed and during the fourth month the goat came into heat, accepted the male and conceived. In due time she gave birth to a healthy male kid. In this way inactive ovaries can be rejuvenated by means of the implantation of young active ovaries.

Bertil Eriksson (1928) conceived the idea of producing oestrus in a sow which failed to come into heat though she was having a special diet consisting of bran and green fodder. He obtained ovaries from sexually matured sows and gave two injections on two succeeding days. Ten days after the second injection the sow came in heat, accepted the male and became pregnant. He treated about 40 sows in this manner and in all cases oestrus appeared from 2 to 14 days after treatment. This satisfactory result encouraged him to apply the same treatment to other domestic animals. For cows he used 50 c. c. (13 drams) of ovarian extract from swine. Heat appeared within 3 to 4 days and all became pregnant. He observed that pregnancy in 90 % of the treated cows resulted in heifer calves. His method of preparing the extract is very simple. He collected the ovaries from pigs freshly destroyed in the slaughter house and macerated them in a sterilized meat grinder (pestle and mortar can also be used for this purpose). To this was added a small quantity of chinisol and a 0.5 per cent phenol solution. Although the extract so obtained is a little cloudy, it can be used without risk.

Greisinger (1928) successfully treated many cows with swine ovary extract. His process was to aspirate fluid from the Graafian follicles of freshly destroyed sows into a sterile bottle and promptly inject the same into senile cows in doses of 5 to 10 c.c. This was repeated every four or five days till the desired effect was achieved.

Hormonic rejuvenation in females may also be secured by treatment of the ovaries with X-rays which destroy the germinal cells and effect hyperplasia of the interstitial tissue. Ovarian grafting, though equally beneficial, is not so common in human practice.

For cases of eclampsia and other serious conditions of inertia, Jeffcoate (1937) advocates the administration of intramuscular injection of oestrin. Usually when there is no anatomical deformity of the female sex organs, spontaneous delivery of the foetus takes place in healthy females owing to the contraction of the uterine muscles at the correct moment of pregnancy but in cases of functional disorders of the ovarian hormone, complete inertia of the contractile muscles of the uterus results and normal expulsion of the foetus becomes difficult. In such cases in pregnant human females, Jeffcoate suggests the injection of 20,000 international benzoate units of oestrogenic hormone every hour till the foetus is expelled. He considers that 8 to 10

injections are generally enough, for in most cases the foetus is expelled even before the completion of the tenth injection. Oestrin in large doses promptly causes the expulsion of the foetus and this is used extensively in midwifery practice to induce abortion. Its administration causes prompt abortion or resorption of the embryo in utero. Doses required to produce this effect increase with the advance of the pregnancy.

As a prophylactic measure against inertia of the uterus, an injection of posterior pituitary hormone (pituintrin, pitocin, pitressin, etc.) may be given twice daily from two weeks before the expected date of delivery. Care should be taken in these cases that the injection is not given when the labour pain has already started as in such cases there is likelihood of the death of the foetus and the rupture of the uterus, cervix and other tender parts on account of the increased muscular contraction.

At a time of difficult parturition in animals caused by the inertia of the uterus or other uterine trouble, an ovarian hormone injection is indicated. For the treatment of animals, the crude form of oestrin, available in the urine of pregnant animals may, after detoxication be used with perfect safety. Prior detoxication is absolutely necessary as it is not always possible to collect sterile urine from pregnant animals.

Further, the writer's experience in finding a large quantity of mucin in the urine of pregnant mares more particularly at an advanced stage of gestation, indicates that this process should be adopted as a routine, otherwise the mucin will have a toxic effect upon the animal so injected. In carrying out pregnancy tests with mare's urine, Becker (1932) and Kust and Zumbaum (1932) found death rate of about 20% in test mice owing to the toxic effect of the decomposed sample of equine urine.

Detection of Sex Hormones

There are various processes for testing the presence of sex hormones in the mammalian system. Sexually matured females, when they exhibit amenorrhoea after coitus should be suspected of being pregnant. In such cases, the best way of arriving at a immediate diagnosis is to conduct a reliable pregnancy test to demonstrate the presence of oestrin or gonadotropic hormone in the urine and blood-stream. The urine of pregnant women is very rich in gonadotropic hormone and induces ovulation and the formation of corpus luteum bodies when injected into immature female mice. In animals, this hormone cannot be detected in any appreciable quantity in the urine but its existence in high concentration in the blood-serum of pregnant mares between the 45th and 200th days has been definitely established. The urine of pregnant animals is very rich in oestrin which brings about signs of oestrus in the uterus, vagina and vulva of the test animals without producing any effect upon the ovaries.

Zondek-Aschheim Test

This is a very reliable test for the identification of gonadotropic or anterior pituitary hormone passed in the urine of pregnant women. In this test, 3 to 5 sexually immature female mice of about 3 or 4 weeks old should be given 6 subcutaneous injections of detoxicated urine at the rate of 0.5 c. c. each in the course of three days. On the fourth day the mice should be killed and their ovaries examined. In positive cases, the occurrence of ovulation and the formation of corpus luteum bodies are noticed in all or in the majority of the test mice, these being indicated by the protrusion of yellowish spots and haemorrhagic points in the ovaries. This test for the diagnosis of pregnancy in women is in about ninety nine per cent accurate, even when made after the 45th day of pregnancy.

Friedman's Test

This is another very reliable test for the detection of gonadotropic hormone in the urine of pregnant women. In this test, sexually immature, unmated female rabbits are injected intravenously with a single large dose (10 to 15 c. c.) of prepared or detoxicated urine from a woman suspected of being pregnant. After 48 hours, the rabbit is destroyed and examined for the development and protrusion of corpus luteum bodies and haemorrhagic spots. Under normal conditions, such young rabbits do not ovulate spontaneously but the gonadotropic hormone, present in the urine of the pregnant woman, induces rapid ovulation and the formation of corpus luteum in the ovary.

It is always better to inject two rabbits for each test if quick results are desired. One of them may be destroyed after 30 hours to find out if ovulation has actually taken place. If the result appears to be negative, the other rabbit should be given a second dose of 10 c. c. of the same prepared urine and should be examined 30 hours later. If the results again appear to be negative and no change is seen in the ovary, the case is definitely a negative one.

Capon Test

This is another reliable test for the identification of the gonadotropic hormone in the urine of pregnant women and in the blood-serum of pregnant mares. Juhn and Gustavson (1930) described the capon test for pregnancy, wherein, as result of the injection of urine from a pregnant woman there is evidence of red pigment in the breast feathers of brown leghorn capons. Greenwood and Blyth (1934) demonstrated the fact that as result of the injection of "pregnant" urine into a brown leghorn capon, its breast feathers changed in colour from black to salmon within 48 hours.

In this test, brown leghorn fowls are injected subcutaneously in the pectoral region from which the breast feathers have been plucked with

10 c. c. of the prepared urine from a pregnant woman or of the blood-serum of a pregnant mare. In positive cases, the newly appearing feathers of that area assume an abnormal red or brownish colour. This change is observed in the course of a week. If earlier diagnosis is required, a few of the growing feathers may be plucked out, slit into small pieces and examined under a microscope.

Xenopus Test

"*Xenopus Laevis*" is a frog of the genus *Aglossa*. It is found in all parts of tropical Africa, as well as in India. These toads vary in size from 2—4½ inches from mouth to anus but medium size toads are most suitable for this test. The distinguishing feature of the female as opposed to the male is that she has three labia in the external opening of the cloaca, two dorsal and one ventral. Hogben (1930-31) observed that hypophysectomy produced ovarian retrogression and injection of anterior pituitary extracts induced ovulation in female South African clawed toads. His observation was confirmed by Charles, Slome, Zwarenstein, Bellerby and Shapiro in the subsequent years. Weisman (1938) reviewed this test for the detection of early pregnancy and considered it to be superior to the Aschheim-Zondek and Freidman's tests in some particulars. The advantages are that the process is very simple and the result is obtained within 24 hours, moreover, the animal need not be destroyed. Elkan (1938) conducted 295 *Xenopus* tests using 2,112 toads within the course of 12 months and endorsed Weisman's judgment as to its reliability.

This test depends on the response of the animal's gonads to the gonadotropic hormone available in the urine of pregnant women. About 6 ounces of morning urine should be collected in a clean bottle. The donor of the urine should try to restrict her fluid intake on the previous day in order to ensure the urine's being concentrated. No sample of urine is reliable unless its specific gravity is at least 1.015. Urine with a 1.020 to 1.030 specific gravity is considered to be most suitable for this test.

Elkan (loc. cit.) describes the following technique for this test:—

Examine the urine for its cleanliness, if turbid, the sample should be filtered. Both untreated and treated samples may be used with safety—the former form is more economical. If treatment of the sample is desired, it may be effected by Zondek's alcohol and acetone precipitation method.

Take 2 c. c. of untreated urine or 1 c. c. of the extract and inject into the lymph sac under the dorsal skin of as many female toads as desired for the one test. Injection may also be given into the leg or into the peritoneal cavity. After injection keep the toads in a test jar which should contain water. The lid of this jar should have holes to admit the entrance of air

and the frog should also have a perforated platform in the centre of the jar upon which to sit. The test jar with the toad should be kept at a temperature of 26° C. Usually in between 4 to 12 hours, the toads will start laying eggs under the action of the genadotropic hormone present in urine. These eggs are blackish-white balls of about 1 m.m. in diameter. Generally toads do not lay eggs in bulk in one place. When the number of eggs laid by these toads is more than 5 or 6, the reaction is said to be positive. Otherwise it should be declared negative after repeating the test once more on fresh batch of toads.

For ordinary purposes, the untreated urine may be injected, within one hour of its receipt, in the late afternoon and the toads left in the jar overnight to read the results on the following morning. Toads once used for this test with positive results cannot be used again within a month and toads giving negative results not within a week.

Brouha Test

This is another test for the identification of gonadotropic hormone in the urine of pregnant women.

In this test male rats or mice are injected subcutaneously with 2 to 3 c.c. of prepared urine. If, as result of this injection, excessive sexual excitement and marked enlargement of the seminal vesicles and the testes occur within a week or ten days, the result is positive — as this is a lengthy process, it is not much practiced.

Stalfor's-Kust Test

This is a very reliable test for identification of oestrin which is available in the urine of pregnant animals, more particularly of pregnant mares. The Zondek-Achheim test, which is intended for the identification of the gonadotropic hormone, proved to be unsatisfactory for the diagnosis of pregnancy in animals as the gonadotropic hormone is not present in the urine of pregnant animals. In this test, 4 ovariectomized mice are injected subcutaneously with the detoxicated urine of the suspected animal at the rate of 0.2 c.c., 0.3 c.c., 0.4 c.c., and 0.5 c.c. each, both morning and evening, consecutively for 3 days. On the 4th day, vaginal smears from these mice are, after staining the slides with Giemsa or Leishman stains, examined under the microscope. In positive cases, the vaginal smears exhibit the presence of the non-nucleated epithelial cells known as cornified or keratinized cells, which are characteristic of oestrus. This test, if conducted after the 45th day of conception, appears to give reliable results in about ninety nine per cent of cases of pregnancy.

Anacleto's Test

The diagnosis of pregnancy in cows has not so far been perfected as has that of mares. However, Anacleto's method appears to be successful

in about 75 per cent cases when it is carried out after 2 months of gestation. In this test the following process should be adopted :—

To 60 c.c. of freshly collected morning urine from a pregnant cow, add 120 c.c. of 95% alcohol and, after shaking and mixing thoroughly, put the mixture in the refrigerator overnight to allow the precipitate to settle. Next morning take off the supernatant fluid and wash the packed sediment three times with ether and dry it in the incubator until the ether is completely evaporated. Emulsify this sediment in 2 to 3 c.c. of normal saline solution to make a uniform suspension. Centrifuge this suspension very lightly and take only the supernatant fluid for injection. Take 3 immature female mice of about six weeks old and inject the fluid subcutaneously three times at the rate of 0.25 c.c., 0.5 c.c. and 0.75 c.c. into each of these mice. The first injection should be given in the afternoon, the second on the following morning and the third the following afternoon. Twenty-four hours after the third injection, destroy the mice and examine carefully the condition of their uterus and vagina. In positive cases, these organs will be considerably inflamed and enlarged and their blood vessels will be markedly engorged with definite signs of oestrus.

Kurosava's Test

Mirskaja and others (1936) claimed to have obtained satisfactory results by adopting the following method of diagnosing pregnancy in cows. They observed that smears taken from the cervix of pregnant cows are characterised by an aggregation of mucus which either contains or is covered with leucocytes; whereas such smears from non-pregnant cows show no cells of ciliated epithelium. They tested 71 pregnant and 22 non-pregnant cows from the 29th to 190th day of pregnancy and obtained correct results in 57 — 92% cases.

Pregnancy Test in Sheep and Goats

A hormonal test for the diagnosis of pregnancy in sheep and goats was carried out but the results were unsatisfactory. As the period of gestation in these animals, as in dogs and cats, is only a very short one, the detection of pregnancy in these animals is of little advantage.

Pregnancy Test in Bitch

Helm (1932) conducted experiments with the urine of a large number of pregnant bitches with negative results. None of his 335 castrated female white mice, which he injected with 28 different samples of urine from bitches known to be pregnant reacted to show signs of oestrus or caused ovulation and corpus luteum formation.

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INFECTIOUS CATARRHAL ENTERITIS OF TURKEYS TRANSMISSION AND PREVENTION *

BY.

W. R. HINSHAW and E. McNEIL

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This disease, formerly known as trichomoniasis, has been described elsewhere, (Hinshaw, McNeil and Kofoed¹, Hinshaw and McNeil²). Our research has shown definitely that the two species of *Trichomonas* found in the lower intestinal tract of turkeys are not pathogenic and, therefore, the term trichomoniasis should not be applied to this disease. *Hexamita meleagridis*, a protozoan parasite belonging to an entirely different group of organisms, is the causative agent. These facts are of practical importance in diagnosis and control.

H. meleagridis occurs where the pathology occurs—in the small intestines. The walls lose their tone and are often thin with bulbous areas. There are no specific symptoms. The poults have no fever; on the contrary the temperature is usually subnormal and the birds seek the warmest parts of the brooder. Diarrhoea if present is of a watery, foamy character.

The most susceptible age is 1-9 weeks, if there are no complicating factors. If, however, the poults have been through some other disease such as pullorum disease or paratyphoid, they may show susceptibility to this disease up to 16 weeks. Especial care should be taken in such flocks to

* This is a revision of a similar report issued August, 1940, Released June, 1941.

avoid sudden changes such as moving, change of food, etc., until they are 12-16 weeks of age.

A relatively large number of survivors of an outbreak continue to harbour the parasite in the intestinal tract and in the bursa of Fabricius. Autopsy studies have shown that it frequently localizes in the region of the ileo-rectal opening (cecal tonsils). It is, therefore, impossible to detect all the carriers of the organism by bursal or rectal examination of live birds. Hexamita are shed in the droppings, and it is possible to transmit them directly from adult birds to young poults. Studies have proved that there is a gradual build-up of infection. The birds which receive organisms from a carrier may receive so few that there is no mortality. After further transfers the number of Hexamita are increased to a point of causing heavy mortality. We feel that this fact has not been sufficiently emphasized.

The first age group of poults on a ranch may receive only a few *Hexamita* from the breeders and show no ill effects, and the owner frequently assumes that they are free from these parasites. *Without a microscopic examination, it is impossible to know definitely whether such birds are carriers. One should always consider it probable that if there is an overlap of breeders and poults, he may introduce a few Hexamita in the poults. The older groups should always be considered potential sources of infection and the same precautions taken to segregate younger age groups as when the acute disease is present on the ranch.* This may at first seem to involve unnecessary labor, but experience has shown that the later mortality causes much more financial loss and increase of labor than routine precautions.

Suggestions for Prevention

The primary source in infection is the intestinal contents of carriers. The entire prevention programme must be built around the recognition of this fact. Finding a satisfactory method of preventing the transfer of droppings from carriers to young birds is the most efficient method of preventing the disease. *No general recommendation as to the best procedure to follow can be given because every ranch requires a separate solution of the problem of eliminating the danger of having carriers on the ranch.* Recent work indicates that quail, chukars and ducks may also be carriers.

Factors which may aid in solving the individual problems are :

1. Separate units and caretakers for the breeding flock and the young poults.
2. Separate equipment for each age group.
3. Intelligent use of wire platforms for feed and water.
4. Intelligent use of cement yards and wire pens.

5. Feeding and watering equipment arranged so that the attendant need not enter the pens, and kept sanitary at all times.
6. If the poults have undergone an outbreak of pullorum disease or paratyphoid, avoid changes in brooding until they are 12-16 weeks of age.
7. Selling all breeding birds 2 weeks before any poults are hatched.

Treatment and Control

Getting an accurate diagnosis is the first essential in the advent of a suspected outbreak of this or any other disease. It is only possible to do this by the aid of laboratory facilities, which includes the use of a good microscope as well as the use of bacteriological technic. Live sick birds are necessary for the accurate diagnosis of infectious catarrhal enteritis, although *Hexamita* may be found by an experienced laboratorian as long as 24 hours after death of the poult, if too rapid decomposition has not taken place.

With our present knowledge of the disease, we cannot make any definite recommendations on how to handle an outbreak. Remedies either in the drinking water or feed should be avoided. *Keeping the poults warm by increasing the heat in the brooder house and increased effort to keep them comfortable is essential.* Removal, and destruction by burial or burning, of all dead poults several times daily is essential to prevent undue spread of the infection. Complete isolation and quarantine of infected pens to prevent spread of the disease to normal poults is the most important factor in the control program. Daily dry cleaning of houses and yards during an outbreak is recommended. Efforts to prevent spread from sick pens to well pens will be much more profitable than time spent in mixing remedies or medicated mashes. No treatment yet tried in controlled experiments has been effective.

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VETERINARIAN'S A B C TO THE AGRICULTURIST

BY

A. KRISHNASWAMI, G.M.V.C.,
Veterinary Assistant Surgeon, Tuticorn.

Animal husbandry is the mainstay of Agriculture.

Agriculture is the mainstay of India.

Animal husbandry and Agriculture are engaging all-India attention at present.

Beware of animal pest as well as agricultural pests and
Be aware of their preventive measures.

Communal grazing is the commonest form of communication of
Contagious ailments among

Cattle. Such ailments that require your care and caution are

Cattle-plague, malignant sore-throat, quarter-ill, anthrax, foot and
mouth etc.

Death is the key-note of Deadly Diseases. Its five letters

Define the preventive measures of dealing with them viz.
(1) Disinfection, (2) Eradication (3) Attention (4) Treatment
and (5) Hygiene. Failure to these,

Denotes Danger and Death.

Eradication of cattle diseases by

Elimination of their infection is the main function of the
Veterinary Department. Your

Earnest Endeavour should be not only to Ensure your safety but
also to

Educate and Enlist the Effective co-operation of your co-agricul-
turists as well.

Firsthand knowledge of the common ailments of cattle is a

Favourable Factor to Fruitful Farming.

Foot and mouth disease is not a fatal affection among Indian cattle;
but a source of

Financial loss to the farmer.

Glanders is a serious scheduled affection governed and controlled by the

' Glanders and Farcy ' Act:

Haemorrhagic Septicaemia and Black-quarter are

Highly fatal to cattle.

Healthy animals as an important factor to

Human beings is highly spoken of in Health-week celebrations...

Improved agriculture is intimately connected with

Improved cattle.

Indifference to animals increases indebtedness.

Johne's disease just like tuberculosis is a slow wasting disease among cattle.

Kindness to animals is not craved of thee as a matter of grace, but, demanded of thee as a matter of right and necessity for the indispensable services they render to thyself.

Livestock improvement is a Laudable and Lively policy
Launched by Lord Linlithgow.

Mortality among cattle is one of the main sources of misery to Mother India.

Mulling of bulls practised in the country

Must give place to Burdizzo's method of castration.

Neglected livestock leads no-where but to National ruin

Never should you neglect to attend to infection in your village.

On the livestock uplift depends Agricultural uplift ;

On the agricultural uplift the Economic one.

On the economic uplift rests the Rural Uplift, and

On the rural uplift, the National one.

Protect your cattle by prompt and

Preventive inoculation ; because, you know that ' Prevention is always Preferable to cure.

Quack treatment in many cases proves to be

Queer and quixotic.

Rinderpest is a cattle disease Ruinous to the Ryot ; while

Rabies is a disease ruinous to all.

Self-help is the best help and so is veterinary help to the ryot.
Systematic castration of scrub bulls is a
Sure and successful method of improving cattle...
Take care of your cattle and the crops will take care of themselves.
Trust your animals and treat them well they, in turn, will
Tend your agricultural wealth.
Uplift of rural cattle is urging the attention of Government at present,
Utilise hence, the services of a veterinarian to the best of your
advantage.
Veterinary aid in the vicinity of villages is the
Vital theme of our Viceroy's scheme.
Wise agriculturists are those who realise that their village
Welfare is identical
With that of their cattle. Ways and means of improving your cattle-
wealth are well-worth your wholetime attention.
X-ray, Y-ray and ultra-violet-ray are the latest developments of
modern medical science for the treatment of many obscure
ailments.
Yours is the duty to look after your cattle and not others.
Yoke-gall though a negligible affection among cattle, is likely to affect
the agriculturist seriously during the working season.
Zealous agriculturists are those who evince their Zeal and
Zest in understanding the above alphabetical hints.

The Indian Veterinary Journal

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Editorial

DISEASES OF THE NEW BORN.

During the past few years, with increasing attention being paid to the work of Animal Husbandry in this country, a number of diseases of New born calves are being brought to light. Some of these diseases appear to be congenital. Amaurosis or glassy eye, Dermoid growths in the cornea and conjunctiva of one or both of the eyes, Paralysis and Fits are some such diseases which are being met with fairly often these days. The majority of these diseased calves lead a miserable existence for a few days or weeks after birth and then die. Only a few of them respond to treatment. Some of these calves are born to good quality cows with a high milking record out of valuable sires and, therefore, their loss at a young age is a very serious one. The cows, consequent on the death of the young ones, fall off considerably in their milk yield and become unprofitable ones. The owners of these animals lose a great deal from their inability to build up a good herd. As such, these diseases are slowly assuming a problem of great economic importance to dairy owners.

It is said that these diseases, or some of them at least, may be of Nutritional origin. There is a good deal of force in it. A good number of the dairy cows, especially in cities and towns, are stall-fed and they rarely get any green grass in their feed. As is well known, green grass is the chief source of Vitamin A to

animals and when this is denied to them, they and their offsprings suffer from Avitaminosis. In addition, there is also a certain amount of imbalance in the diet of the animals during their pregnancy—chiefly a deficiency of calcium—and this also adversely affects the general tone of the new-born calf. This is very well illustrated by the spectacular cures obtained in some of the cases of Fits and Paralysis in young calves by parenteral administration of calcium with internal administration of Cod-liver oil or Shark Liver oil. It is thus clear that a liberal intake of calcium and green grass during the period of pregnancy, at least in its later stages, would have prevented the diseases of the new-born calves and the remedy, therefore, resolves itself in these cases to one of improved feeding and stable management.

But in regard to other diseases like Dermoid growths and Amaurosis, we are not quite on safe grounds with reference to their causal factors. The nutritional theory does not offer an adequate explanation, because those cases have been met with even in well organised and well-run dairy establishments. The tendency is more to blame the sire of these calves. Some of the breeding bulls used for the serving of these cows appear to be the real culprits, although apparently, they have got all the good points of a breeding bull. The calves born to them suffer from total blindness either with no visible alterations in the eye or with apparent gross lesions. Evidently the bulls are transmitting a hereditary defect inherited by them.

Kuppuswamy (1937) in his observations on the incidence and inheritance of imperforate anus in Ganjam calves has drawn attention to the importance of the lethal and sub-lethal factors in the breeding of livestock and we think that here are some cases requiring some close and prompt investigation about the incidence of these diseases of the New-born.

RECRUITMENT OF VETERINARY SURGEONS TO I.A.V.C.

We draw the attention of the Government of India and the Military authorities to a representation of the students of Bombay Veterinary College, published in our Correspondence column, about the terms of pay and services of the I.A.V.C.

The Graduates of our Veterinary Colleges receive a very high standard of Veterinary Education and it is but meet that their professional attainments are adequately recognised. The Government is the chief agency in this country to employ the services of the Veterinary Surgeons and they should therefore set an example by treating these officers fairly decently by offering them emoluments that are commensurate with their educational and professional qualifications. There should not have been any need at all for any representation about the inadequacy of pay and emoluments, especially for war services. But experience has shown that it has become more or less natural for the Government to belittle the value of scientific men in the beginning. A series of memorials and petitions have been found necessary to rouse them to appraise the services correctly and probably that is the reason for this representation also.

The demands are very fair and reasonable and the Government and the Military authorities should not find any difficulty in granting them.

RETURNED HOME

M. V. PILLAI, G.B.V.C.

(Contributed)

Our readers are familiar, we are sure, with the name of Mr. M. Velu Pillai, G.B.V.C., late of Penang, who has been from a long time, a frequent contributor to this *Journal*, on clinical and other professional subjects of interest and importance.

Mr. Pillai after graduating from the Bengal Veterinary College, joined the Civil Veterinary Department in the Central Provinces in 1914 and held charge of Khandwa and Pachmarhi Hospitals and was for sometime in charge of the animals of the

Administration Camp of H.E. the Governor (then styled as the Hon'ble the Chief Commissioner) of Central Provinces. He also worked as a Laboratory Assistant in Nagpur under the late Mr. Valadares. In 1919 he took up service in Travancore—his own native place—and worked as Office Veterinary Assistant to the Director of Agriculture. While in Travancore service, he was deputed by the State Government to Karachi, Bangalore, Poona and Bombay to purchase Sindhi cows and Surti buffaloes, which duty he carried out quite successfully.

Towards the end of November 1922, the Municipal Veterinary Department of Penang offered him the job of Assistant Municipal Veterinary Officer and he left Travancore for Penang and took up the new job there. The nature of his duty there was to supervise the work of the P. C. A. Section by visiting the dairy and cattle sheds and markets and to prosecute and conduct the P. C. A. cases at the Police Courts. He was also in charge of the Animal Infirmary and Slaughter Houses there. This post was however abolished in 1935 when he prematurely retired from there. The President of the Municipal Commissioners said at the time in his report as follows:—“Mr. Pillai is a zealous, conscientious and capable officer and on three occasions on which he has been largely in control of his department when the head of the Department was absent on long leave, he has shown a capacity for decision and for undertaking responsibility”.

After the premature retirement in Penang he was entertained in Johore Veterinary Department where he was in charge of the newly constructed Veterinary Department and of the animals of His Highness the Sultan of Johore. In all these capacities he has shown conspicuous capacity—professional and administrative. As we have already said his contributions, on professional subjects are varied and many and they have appeared in these columns from time to time from the very beginning.

It is interesting to know that four members of his family are Veterinarians. His younger brother Mr. K. S. Nair, G.B.V.C., held a responsible appointment in Singapore on a super scale

salary. His nephew is a student of the Royal (Dick) Veterinary College, Edinburgh and his eldest son, after a course of Engineering studies in the University of Edinburgh is in the Royal Air Force in England. Mr. Pillai returned home in November last on a leave of two months preparatory to retirement after a long service in the Malayan Peninsula now unfortunately in the grip of the great war. His return has been just in time. He has settled down in Trivandrum "quietly". But his recent appeal to the Veterinary Surgeons in Travancore, which appeared in the last issue of this *Journal* indicates his keen desire to continue his activities in the cause of the profession he loves very much. We wish all the Veterinary Surgeons after their retirement will follow the good example of Mr. Pillai.

We wish all happiness and health to Mr. Pillai to enable him to continue to render service to the profession in his native land.

RETIREMENT OF Mr. C. N. DESAI, G.B.V.C.

Mr. C. N. Desai after passing the Matriculation examination of the Bombay University, joined the Arts College to prosecute his studies in the Arts Course but after a study of one year, his financial circumstances did not permit him to continue there. He therefore joined the Bombay Veterinary College where he was lucky enough to secure stipends to enable him to complete his studies. After graduating at the end of three years, in 1908 December, he set up practice in Bombay. But he was forced to join the Civil Veterinary Department, Bombay, as Veterinary Assistant Surgeon in 1909. He held charge of the Veterinary Hospitals at Broach and Ahmedabad for 14½ and 12½ years respectively. He was a very popular, quiet, unostentatious and efficient doctor. In December 1936 he was appointed as Veterinary Inspector of Northern Range with headquarters at Surat. In 1939, he was appointed as Officiating Deputy Director of Veterinary Services and on the 1st of March 1940, he was made permanent in that post. He retired from service on the 5th of October 1941.

We wish him long life, health and happiness, to enjoy his well earned pension.

Clinical Cases

OBSERVATIONS ON RABIES IN DOGS.

BY

K. S. PRAKASA RAO, G.M.V.C.,
Veterinary Assistant Surgeon, Bezwada.

Subject:—A Fox Terrier bitch, aged about three years, was reported to have caused an unprovoked attack and bitten the forearm of an attendant of the house. The dog was first locked in a room. It was then caught from there with great difficulty and brought to the Veterinary Hospital, where it was caged.

History:—It was said that the dog was always kept within the compound, from where it had no occasion to go out and that there was no possibility of any stray dogs coming into the compound. The owner could not recollect any occasion of the dog coming in contact with any other street dogs to account for the development of Rabies. It was, however, stated that the dog was always hunting bandicoots, and that it received bites from them several times.

Symptoms:—All the clinical symptoms pathognomonic of furious form of rabies were present. The animal died on the 3rd day after the manifestation of the symptoms. Laboratory report confirmed it as Rabies. The bitten persons and animals were advised to undergo anti-rabic treatment.

The author of this article came across previously three dogs showing symptoms of rabies due, it was said, to the bites received as a result of a fight with bandicoots. The information thus obtained could not be said to be conclusive in itself, as the owners could not say definitely that the three dogs had not come in contact with the street dogs either before or after the bites from bandicoots.

The Director, Pasteur Institute, Coonoor, who was subsequently addressed on the subject has given the following information:—

“I am aware of the interesting observation recorded in your letter. Some months ago it was reported that the livestock in an Estate nearby were dying mysteriously. Two dead rats from the Estate were sent to this Institute for examination. Definite evidence of rabies was found in one of the rats. We wanted to investigate whether rats could be natural carriers of the disease, but we could not pursue the subject for lack of material.

So far it is known that the Vampire (Bat *DESMODUS ROTUNDUS*) has a high natural resistance against rabies. It has been shown that it is capable of harbouring the infection and transmitting it without itself showing any symptoms of the disease.

Although there is no reason why rats should not die of rabies, there is no recorded evidence to show that they could be carriers of the disease. I will be glad to investigate into this matter if you could furnish me with the following material.

(a) The brains of bandicoots (*NESOKIA BANDICOTA*) trapped from the localities in which the dogs were bitten and died of rabies.

(b) The brains of bandicoots which are found dead in those areas.

(c) Particulars regarding the date of bite, site of bite, incubation period, course of the illness and the results of diagnostic tests, if any, carried out in the cases mentioned in your letter."

With a view to know whether any abnormalities could be detected, the brain from a bandicoot freshly killed was submitted for examination. No definite evidence of rabies had been obtained from the microscopical examination of the brain.

This article has been written with a view to get the co-operation of the members of the profession in obtaining definite information about bandicoots, whether they act as carriers of rabies infection and whether they have anything to do with the sudden outbreak of rabies among dogs.

RUPTURE OF BLADDER IN A BULL CALF

BY

V. V. VENKATACHALA IYER, G.M.V.C.,

A. V. HARIHARAN, G.M.V.C.,

AND

MAHAMAD MONZUR HUQ, G.M.V.C.,

Veterinary Assistant Surgeons, Madura.

History:—A bull calf was brought to the dispensary on 18-8-41 at 9-30 A. M., with the history that it had not passed urine for the previous four days.

Symptoms:—It was uneasy and restless, occasionally kicking at the abdomen. On palpation the abdomen was found to be distended with fluid. Aided by the history that it had not passed urine for four days, the case was provisionally diagnosed as a case of rupture of the bladder with escape of urine into the abdominal cavity. Temperature was 103·6° F, pulse slightly

accelerated, respiration fairly normal and visible membranes slightly congested. Bowels were constipated, the dung being passed in very hard pellets occasionally. Rectal examination revealed an empty bladder.

The owner was advised to have the calf operated on as previously a case had been successfully treated in that manner. He was not willing for it and so he took the calf away home that day after it had been given an enema and a mixture containing Mag Sulph & Potash Acetas.

It was brought back to the dispensary on 20-8-41 at about 8 A. M., and consent was given for operation.

Operation:—The operation consisted of laparotomy and suture of the rupture in the bladder. The patient was prepared by giving an enema and evacuating the bowels. The inferior abdominal region was shaved; washed, dried and Tr. Iodine painted over it. An aqueous solution containing 45 gr. of chloral hydras was injected intravenously and the calf was placed on the table in the dorsal position.

A para-median incision about 9 inches long was made on the skin parallel to and $\frac{1}{2}$ inch away on the right side of the linea alba avoiding the penis. It was carried through the subcutaneous tissue and abdominal muscles, taking care not to injure the blood vessels. Simple dry sponging was done. The peritoneum was opened and secured separately with artery forceps. The abdominal cavity contained about $2\frac{1}{2}$ gallons of urine.

On draining this fluid and examining the bladder, it was found to be almost collapsed with only a small quantity of urine and gritty deposits. There was a rupture about an inch long in the inferior wall of the bladder. The organ was gently taken out of the cavity and the rupture enlarged to a length of about 3 inches. The wall of the bladder was slightly thickened and its inside was congested in patches and echymosed. It was completely emptied and then flushed with $\frac{1}{2}$ per cent acriflavin solution and sponged. The edges were brought together by Lembert's sutures with sterile catgut and the bladder placed in position.

The abdominal cavity was sponged thoroughly with acriflavine solution and sutured as in laparotomy with 2 series of sutures one through the peritoneum and muscles with catgut and another through the skin with twine.

The suture wound was dressed with Tr. Benzoin Co, covered with Iodoform gauze and bandaged.

The calf was conscious but quiet throughout the operation.

It was removed from the operation table and placed on the floor. In about 30 minutes the effects of chloral hydras passed off completely and the calf then stood up and took some water. It was fed that day only on mere barley water and plain water.

The next day, the calf was lively, took barley conjee and passed clear urine in a normal way. Temperature 101.8° F in the morning and 103.6° F in the evening. Food consisted of barley water, glucose D and water. Sulphanilamide 3 tablets were given orally.

Third to tenth day: Condition remained the same, the diet and treatment was continued. The recovery was uneventful and the calf was discharged cured on 1-9-41.

A CASE OF TWIST OF THE SMALL INTESTINES IN A BULLOCK

BY

M. RAMAKRISHNA PILLAI, G.M.V.C.,
Veterinary Assistant Surgeon, Madanapalle.

Subject :— Local bred bullock, age about 4½ years (case No. 1564) admitted on 10-8-41.

History :— The animal took ill all of a sudden and was off-feed for 5 or 6 days before admission into hospital. No dung was passed and the urine was bloody. The owner had unsuccessfully tried all sorts of pungent drugs to move the bowels of the animal.

Symptoms :— Dull, off feed, rumen impacted, examination through rectum revealed the presence of only small quantity of faeces. Temperature was 103°. Smears negative for Babesiasis.

Diagnosis :— Pyrexia due to impaction of the rumen.

Treatment :— 10-8-41. A dose of saline laxatives with stimulants was given; also an enema with soap water.

11-8-41. No movement of the bowels. The salines and the enema were repeated.

12 and 13-8-41. No movement of the bowels, nor any improvement in general condition.

Enema was repeated. The abdomen was given a good massage. The animal was put on a dose of vegetable bitters and the progress watched.

14-8-41. Animal much in the same condition: a very small quantity of dung was passed. A pound of Mag. Sulph with half a pound of Sodi chloride in a pint and a half of water was given.

15-8-41. Condition of the animal same as on previous day. A pint and a half of Oleum Lini with Amm. Carb and Pulv. Nux Vomica was administered.

16-8-41. No improvement. Animal's condition worse. Physostigmine $\frac{3}{4}$ grain was injected hypodermically. Half an hour after injection the animal started profuse vomition and died with violent convulsions.

Postmortem examination revealed the presence of an organised twist at the iliac portion of the small intestines, about one and a half feet from its junction with the caecum; also a highly inflammatory condition of the kidneys. The whole of the digestive tract from the rumen up to the place of twist in the small intestines, was engorged with plenty of decomposed ingesta with an offensive smell.

All other organs were normal.

Observations :—1. It would be seen that while repeated doses of purgatives had no action on the movement of the bowels, the manifestation of colicky symptoms that one would expect to find in a case of twist of the bowels was totally absent in the present case. It is the absence of this symptom that suggested the use of physostigmine which is contraindicated in cases of twist of the bowels.

2. The inflammation of the kidneys noticed during postmortem and the passing of red urine during life, might have been due to the administration of pungent medicines by the owner.

A CASE OF CHOKING IN A CALF WITH HAIR BALL

BY

P. MATHEW KURUVILLA, G.M.V.C.,
Veterinary Assistant Surgeon, Piler.

Subject :— A bull calf, 4 months old, Nellore breed.

History :— On 5-11-41 at about 9-30 P. M., the calf was brought to the Veterinary Dispensary, Piler, with distressing symptoms. The owner said the calf was hale and healthy till about 7-30 P.M. Suddenly it stopped feeding, became restless and gasped for breath. The animal was rushed to the Veterinary Dispensary from a distance of two miles.

Symptoms and diagnosis :— The animal was found standing with its head down gasping and coughing at intervals. There was abundant flow of saliva. The nostrils were dilated and there was laboured breathing. Slight tympany of the rumen was present and the temperature was 104° F. An attempt was made to examine the pharynx through the mouth. This, the animal greatly resented. Examination of the oesophagus revealed a round mass just behind the pharynx. The trouble was at once diagnosed as choking.

Treatment:—It was impossible to remove the obstruction through the mouth. An ounce of castor oil was administered by the mouth just to lubricate the obstructed mass and gentle massage was applied with the fingers on either side of the neck behind the obstacle. The obstruction did not move. Dry fomentation was then applied to the seat of obstruction. Within half an hour a round hair ball $1\frac{1}{2}$ " diameter, came out through the mouth and the animal was relieved of the trouble.

Remarks:—The owner informed me subsequently that the calf was always in the habit of licking its mother. This accounts for the formation of the hair ball in the rumen. This must have been regurgitated up the gullet during rumination and caused choking. It is not known if choking by a hair ball has been observed by any one else in small calves and the case is, therefore, considered interesting and worth recording.

ULCERATIVE STOMATITIS IN CALVES

BY

MUHAMMAD RAHIMUDDIN, G.M.V.C.,
District Veterinary Officer, Vizagapatam.

Ulcerative Stomatitis in Calves otherwise known as Necrotic Stomatitis or Calf Diphtheria is an infectious disease of baby calves caused by "Actinomyces Necrophorus."

The disease is characterised chiefly by the following symptoms:—off-feeding; salivation of various degree; inflammation of buccal mucous membrane; presence of necrotic sores on both sides of the gums, upper and lower surface of the tongue and buccal mucous membrane; initial high temperature with a fall to subnormal as the disease progresses; later on digestive troubles such as constipation, greyish or dark green diarrhoea, with foetid odour and extreme emaciation: in neglected cases, death from persistent diarrhoea, toxæmia and exhaustion.

Prognosis: If the cases are taken on hand at an early stage, and treated 90 per cent. of the sick ones recover in about a fortnight.

Treatment: First and foremost is the prophylaxis. Isolation of the affected ones, provision of clean bedding, thorough disinfection of the calf-pens, cleanliness of feeding utensils and cleaning of cows' udders before allowing the calves to suck—these must be strictly enforced. As regards the curative side, internal administration of Lysol—10 to 15 minims in two to three ounces of treacled water with one to two drams of Bicarbonate of Soda once a day gave good results. The mixture checked the progress of the

disease. For the mouth lesions, application of powdered alum was found to be good. Irrigating the mouth with 5 per cent. Pot. Permanganate lotion and in bad cases dressing the mouth with Boro Glycerine were also found necessary. Lastly a course of tonics with Hydrargyri cum creta is beneficial.

From 15-9-38 to 11-11-38, that is, within a period of two months, seven cases of Ulcerative Stomatitis were treated by the author in the Livestock Research Station, Hosur Cattle Farm, (Madras). All were young calves below one month of age. Of these five recovered and two succumbed to the disease. As the disease appeared to affect only baby calves, it is probable that the organisms associated with the disease gain entrance to the affected parts at the time the temporary incisors appear.

The Principal, Madras Veterinary College, was kind enough to examine smears from the lesions of certain calves and reported *Bacillus Necrophorus* being present.

Remarks: In big cattle breeding farms it is natural that there will be a fairly large number of baby calves always on hand. Unless proper hygienic measures are duly adopted, the loss to the institutions will be appreciable from the mortality of these calves which go to build up the future herd of the farm.

Association News

THE ALL-INDIA VETERINARY ASSOCIATION, MADRAS BRANCH.

PROCEEDINGS of the General Body Meeting held at the Madras Veterinary College on Thursday, the 29th January 1942, at 4 P.M.

Members Present.

- | | |
|-----------------------------|------------------------------|
| 1. Rao Sahib K. Kylasamier, | 19. Mr. V. Gurumurthi, |
| <i>President</i> | |
| 2. „ M. Anant Narayan Rao, | 20. „ P. Satyendra Rao, |
| 3. „ H.N. Chelva Iyengar, | 21. „ K. Achanna Shetty, |
| 4. Mr. K. S. Nair, | 22. „ K. P. Doraiswamy, |
| 5. „ M. Y. Mangrulkar, | 23. „ E. J. Padmanabha Nair, |
| 6. „ R. Narsinga Rao, | 24. „ T. Seetharaman, |
| 7. „ T. S. Alagappa Pillai, | 25. „ R. Veeramoney, |
| 8. „ L. S. Parameswaran, | 26. „ M. C. Chellam, |
| 9. „ R. Swaminathan, | 27. „ K. S. Venkataraman, |
| 10. „ V. Janakirama Iyer, | 28. „ S. Venkataraman, |
| 11. „ L. A. Sarma, | 29. „ D. A. Ramanadhan, |

- | | |
|----------------------------------|-----------------------------|
| 12. Mr. S. Vaidyanatha Mudaliar, | 30. Mr. E. J. Ambrose, |
| 13. „ P. Srinivasa Rao, | 31. „ V. Venkataraman, |
| 14. „ K. S. Gopalakrishnan, | 32. „ K. N. Govindan Nair, |
| 15. „ S. N. Vaidyanathan, | 33. „ P. Balakrishna Menon, |
| 16. „ E. R. Nagarajan, | 34. „ S. Shanmugam, and |
| 17. „ P. M. Thillainayagam, | 35. „ D. Mariappa. |
| 18. „ G. Ayyavu Sastry, | |

Resolutions :

1. *This Meeting of the Profession held under the auspices of the A.I.V.A., Madras-Branch, places on record its profound sense of sorrow at the passing away of Mr. M. R. V. Panikkar, and conveys its condolences to the Members of the bereaved family.*
2. *Resolved that a Memorial in the form of a Medal or Prize be instituted in the name of Mr. Panikkar to be awarded annually to the best outgoing Graduate of the Madras Veterinary College ; and it was further resolved that in furtherance of this object an appeal for funds be made to the Members of the Profession both in the city and the mofussil.*

Proposed by Rao Sahib M. Anant Narayan Rao ; Seconded by Mr. L. S. Parameswara Iyer ; carried unanimously.

3. *Resolved that a Portrait of the late Mr. M. R. V. Panikkar be presented to the Madras Veterinary College.*
4. *Resolved that an amount of Rs. 59-10-0 from Saunder's Portrait Fund be transferred to meet the charges of the Portrait.*
5. *Resolved that an Executive Committee with powers to co-opt, consisting of*
 1. *R. Swaminathan—Treasurer,*
 2. *Rao Sahib M. Anant Narayana Rao,*
 3. *L. A. Sarma,*
 4. *P. M. Thillainayagam,*
 5. *K. S. Gopalakrishnan,**be formed with President and Secretary as ex-officio Members.*

The following Office bearers for the Association were elected for the ensuing year :—

President : Rao Sahib K. Kylasamier.

Secretary : R. Swaminathan.

Joint Secretary & Treasurer : D. A. Ramanadhan.

THE INDIAN VETERINARY JOURNAL

Members of the Committee :

- | | |
|-------------------------------------|----------------------------|
| 1. K. S. Nair, | 7. L. A. Sarma, |
| 2. Rao Sahib M. Anant Narayana Rao, | 8. T. Seetharaman, |
| 3. Pangal Srinivasa Rao, | 9. L. S. Parameswara Iyer, |
| 4. P. M. Thillainayagam, | 10. T. Vinayaka Mudaliar, |
| 5. S. Vaidyanatha Mudaliar, | 11. S. N. Vaidyanathan, |
| 6. M. Y. Mangrulkar, | 12. E. J. Ambrose. |

K. Kylasamier,
President,

THE ALL-INDIA VETERINARY ASSOCIATION, MADRAS BRANCH.

An Appeal.

At a Meeting of the A. I. V. A., Madras Branch, held at the Madras Veterinary College, on the 29th January 1942, with Rao Sahib K. Kylasamier in the Chair, the following resolutions were passed.

1. *This meeting of the members of the Profession held under the auspices of the A. I. V. A., Madras Branch, places on record its profound sense of sorrow at the passing away of Mr. M. R. V. Panikkar and conveys its condolences to the members of the bereaved family.*
2. *Resolved that a Memorial in the form of a Medal or Prize be instituted in the name of Mr. Panikkar to be awarded annually to the best outgoing Graduate of the Madras Veterinary College ; and it was further resolved that in futherance of this object an appeal for funds be made to the members of the profession both in the City and the mofussil.*
3. *Resolved that a portrait of the late Mr. M. R. V. Panikkar be presented to the Madras Veterinary College.*
4. *Resolved that the amount of Rs. 59-10-0 from Saunder's Portrait Fund be transferred to meet the charges of the portrait.*
5. *Resolved that an Executive Committee with powers to co-opt, consisting of.—*
 1. *R. Swaminathan — Treasurer,*
 2. *Rao Sahib M. Anant Narayan Rao,*
 3. *L. A. Sarma,*
 4. *P. M. Thillainayagam,*
 5. *K. S. Gopalakrishan,*

be formed with the President and Secretary as ex-officio members.

The following Office-bearers for the Association were elected for the ensuing year :

President : — Rao Sahib K. Kylasamier,

Secretary : — R. Swaminathan,

Joint Secretary and Treasurer : — D. A. Ramanadhan.

Members of the Committee :

- | | |
|------------------------------------|------------------------------|
| 1. Sri K. S. Nair, | 7. Sri L. A. Sarma, |
| 2. Rao Sahib M. Anant Narayan Rao, | 8. „ T. Sitaraman, |
| 3. Sri P. Srinivasa Rao, | 9. „ L. S. Parameswara Iyer, |
| 4. „ P. M. Thillainayagam, | 10. „ T. Vinayaka Mudalier, |
| 5. „ S. Vaidyanatha Mudaliar, | 11. „ S. N. Vaidyanathan, |
| 6. „ M. Y. Mangrulkar, | 12. „ E. J. Ambrose. |

In pursuance of the above resolutions, a subscription list was opened at the meeting itself and a sum of nearly Rs. 150/- was subscribed.

This appeal is now issued to the members of the profession earnestly commending the above resolutions for their sympathetic consideration and with a request that they subscribe to the Endowment Fund very liberally.

Subscriptions may be sent to : —

R. SWAMINATHAN,

Lecturer, Madras Veterinary College, Vepery, Madras.

MADRAS,
5—2—1942. }

K. KYLASAMIER,
President.

**List of subscriptions for the Endowment Fund in the name of the late
Mr. M. R. V. Panikkar**

	Rs.	As.	Ps.
1 Sri K. S. Nayar	10	0	0
2 „ Rao Sahib K. Kylasamier	10	0	0
3 „ „ M. Anant Narayan Rao	10	0	0
4 „ M. Y. Mangrulkar	10	0	0
5 „ R. Narasinga Rao	10	0	0
6 „ Rao Sahib H. N. Chelva Ayyangar	10	0	0
7 „ R. Swaminathan	10	0	0

8	„ R. Veeramani Ayyar	10	0	0	Paid
9	„ T. S. Alagappa Pillai	5	0	0	
10	„ S. Vydhanadha Mudaliar	5	0	0	
11	„ L. A. Sarma	5	0	0	
12	„ V. Mahadevan	5	0	0	
13	„ L. S. Parameswaran	5	0	0	
14	„ G. R. Viswanathan	5	0	0	1st instalment paid
15	„ T. Raghavan	5	0	0	Paid
16	„ V. Janakiraman	3	0	0	do
17	„ P. M. Thillainayagam	3	0	0	
18	„ M. C. Chellam	3	0	0	do
19	„ K. S. Venkataraman	3	0	0	do
20	„ D. A. Ramanadhan	3	0	0	
21	„ P. Srinivasa Rao	2	0	0	
22	„ K. S. Gopalakrishnan	2	0	0	
23	„ E. R. Nagarajan	2	0	0	do
24	„ K. Achanna Shetty	2	0	0	
25	„ K. P. Doraiswami	2	0	0	do
26	„ T. Sitharaman	2	0	0	
27	„ S. Venkataraman	2	0	0	do
28	„ E. J. Ambrose	2	0	0	
29	„ P. Balakrishna Menon	2	0	0	
30	„ D. Mariappa	2	0	0	
31	„ A. S. Mahadeva Iyer	2	0	0	Paid by m. o.
32	„ L. N. Subrahmanyam	2	1	0	do do
33	„ S. N. Vydhanadhan	1	0	0	
34	„ G. Ayyavu Sastry	1	0	0	do
35	„ V. Gurumurti	1	0	0	
36	„ Satyendra Rao	1	0	0	
37	„ V. J. Padmanaba Nair	1	0	0	
38	„ V. Venkataraman	1	0	0	
39	„ K. N. Govindan Nair	1	0	0	
40	„ S. Shanmugam	1	0	0	
41	„ R. Venkataraman	2	0	0	
42	„ P. V. Venkatachalam	1	0	0	do

Correspondence

To

The Editor,

Indian Veterinary Journal, Madras.

Sir,

Recruitment of Veterinary Surgeons in I.A.V.C.

May I request the hospitality of the columns of your esteemed *journal* to attract the attention of the Military Authorities and my professional brothers regarding the recruitment of the Veterinary Surgeons in the Indian Army Veterinary Corps?

The pay and other allowances as offered to the Veterinary Graduates in I. A. V. C., have not been so lucrative as to attract the attention of our Graduates. In spite of the advertisements in the papers and a circular by the Director of Bombay Veterinary Services to Veterinary Surgeons to inform him if they like to join I. A. V. C., there has been practically no response. Recently, the students of the Bombay Veterinary College asked for certain terms *e. g.*, same treatment as regards pay and allowances as to I. M. D., and family pension and educational allowance to children. The Bombay Veterinary Medical Association also passed a resolution on the above lines, but nothing has been done so far. May I request the All-India Veterinary Association to take up the matter and get us due justice? Will the Military Authorities take note of the present events, and accept our demands and mobilise our efforts to win the War?

Yours etc.,

C. F. MATANEY,

Bombay, }
18—2—'42. }

Final Year Student, Bombay Veterinary College.

To

The President,

Bombay Veterinary Medical Association,
Bombay.

Sir,

We the students of the Bombay Veterinary College beg to bring to your kind notice a few points regarding the recruitment of Veterinary Assistant Surgeons in Indian Army Veterinary Corps and request to approach the concerned Military authorities for the due justice.

We demand the same grade and treatment as given to medical people and request you to plead for the following demands of ours ; —

Emoluments : — Jamedar Rs. 200 to Rs. 270/- p. m. Subhedar Rs. 285- to Rs. 300/- p. m. Sub-charge pay when holding sub-charge of Military Hospital from Rs. 15/- to Rs. 40/- p. m. Free accommodation and ration or compensation in lieu, free medical aid, free water and lighting, free accommodation for families except during training period and also free water and lighting when the officer is on field service.

Ante-date of Commission : — Professional experience upto 5 years. For higher qualifications upto one year. The period of ante-date to count for increments of pay and seniority in the service.

Additional concession : — Preferential treatment in connection with recruitment to Civil Veterinary Departments after the War. In the case of Government service grant of lien in Civil, confirmation in a civil appointment on the occurrence of a suitable permanent vacancy. Period spent on Military duty to count in full towards pay, promotion in the Civil Department.

Disability Family Pension : — Veterinary Assistant Surgeon who is pronounced permanently unfit for general service owing to disability attributed to field service and assessed cent per cent, may, at the termination of his service on account of such disability be granted a total pension of Rs. 60/- p. m. if he is a Jamedar and Rs. 85/- p. m. if he is a Subedar. The widow of a Veterinary Assistant Surgeon who is killed in action or dies of wounds received in action is eligible for the grant of monthly pension of Rs. 50/- and in addition a gratuity of Rs. 1200/- irrespective of the rank. Children should receive each Rs. 175/- per annum and if motherless Rs. 250/- per annum irrespective of the rank of the officer and in special cases of pecuniary need an educational allowance not exceeding Rs. 310 per annum should be paid.

We beg to remain,

Sir,

Bombay, }
21-1-42. }

Your most obedient servants,
Students of Bombay Veterinary College.
(Signed by 73 students).

Abstracts

Rapid diagnosis of canine distemper, BY R. G. GREENE AND C. A. EVANS :—An accurate diagnosis of distemper, particularly dependable in foxes and dogs, is obtained by the demonstration of 'specific' inclusion bodies, in paraffin sections made of formalin-fixed tissue and stained with haematoxylin and eosin or Giemsa, and so reducing the time required for a diagnosis from several weeks by ferret inoculation to only a few days.

The authors describe the inclusion bodies, as varying in size from $\frac{1}{2}$ to 2 microns up to 15 or 20 microns, cytoplasmic, in some intranuclear, both types being found principally in the epithelium, particularly lining the urinary tract, bronchial tree, gastro-intestinal tract and ducts of the glandular tracts notably of the salivary glands, the bile and pancreatic ducts; epithelial cells of the adrenal and reticulo-endothelial cells of the lymph nodes and spleen may also contain them. This distribution both in cells of the surface epithelium throughout the body and other sites noted is pointed out as peculiar.

In fox encephalitis, the disease most apt to be confused with distemper; the inclusion bodies are always intra-nuclear, found principally in the cells of the vascular endothelium, occasionally in lymph nodes and in hepatic cord cells but never in bile ducts nor in other surface epithelial cells as in distemper.

These bodies appear to develop fully late in the course of the disease and therefore tissue from animals which have died of the disease is preferable to those from the killed when sick.

The rapid method principally applicable to foxes and minks consists in the demonstration of these bodies within an hour by the smear method. They are easily demonstrable in the transitional epithelium of the bladder; if the organ is found unsuitable the epithelium lining the trachea or nasal cavities may be tried; in fact, this is reported as useful for any type of cell which can be readily transferred to a slide.

Scrapings are gently made with a scalpel from the lining of the bladder, emulsified in a drop of Mayer's albumin fixative on a slide and spread into a smear and stained wet or dry as for the sections method. Formalin preserved tissue must be blotted dry and passed through methyl alcohol before staining. According to the authors, characteristic inclusion bodies are present in more than 90 per cent of fatal cases, and an examination from 2 or 3 animals from the same outbreak yields a positive diagnosis if distemper is present. If there is auto-lysis of the tissue cells paraffin sections may better be made for the diagnosis.

With haematoxylin and eosin, inclusion bodies are most clearly visible if the tissue is slightly overstained with eosin and understained with haematoxylin.

Giemsa staining, at least in some instances, seems to distinguish in the inclusion two substances, an acidophilic component staining red and an apparently basophilic one which stains a deep blue-black. The inclusion may appear entirely in one color or the other, but usually contains both, in almost any conceivable ratio.

The authors impress the need, not only for early but correct diagnosis of distemper outbreaks, for adopting effective control methods.

Cornell Veterinarian, Vol. XXIX. No. 1. January 1939 pp35-40.

A new system of anthelmintic control for gastro-intestinal parasites of ruminants. BY D. W. BAKER. Since the report of Monnig and Ortlepp (1936) that the oral administration of a mixture of tetrachlorethylene and mineral oil in equal amounts directly after the injection of 2 per cent copper sulphate into the throat to bring about closure of the oesophageal groove resulted in a marked reduction of the worm parasite burden in experimental sheep, the author began the critical testing of a slightly modified technique upon parasitised calves, sheep and goats; it showed itself superior to other conventional systems of anthelmintic medication in animals heavily infected with the small trichostrongyles for which competent veterinary observers throughout the world admit the ineffectiveness of drugs in general use at the present time for control of parasitism.

The treatment consists on the following lines. No preliminary starving is required. The group of calves, sheep or goats to be treated are placed in a cool, quiet environment for a convenient pre-treatment period. 2 or 3 c. c. of a 5 per cent solution of copper sulphate are sprayed into the throat, or in weaning lambs and young calves a gauze swab soaked in 10 per cent copper sulphate solution applied hastily to the mucosa of the lips and cheeks inside the mouth followed by the drench of the mixture of tetrachlorethylene and mineral oil, the dose depending on the size and weight of the animal.

Lambs 30-60 lbs. 8-15 c. c. depending on weight.

Normal adult sheep and goats. 20-30 c. c.

Calf (100-150 lbs). 20-30 c. c. Proportionate dosages are advised for larger calves sheep and goats.

The following case reports are appended.

A group of calves raised on the same pasture, showing unthriftiness, stunted growth, digestive derangement and diarrhoea, suspected to be affected with a severe type of parasitism, revealed, in one of them that died, at post-mortem approximately 2000 *Ostertagia ostertagia* in the abomasum,

3500 *Cooperia onchophora* and 200 *Nematodirus* species in the small intestines. With the death of three more in the group, a diagnosis of parasitic gastro-enteritis was made and 1 per cent copper sulphate solution administered; one more calf died without apparent reduction in the trichostrongyles. The author's treatment was then adopted, after removal from the pasture, the dose rate being .2 c. c. per pound body weight. All were treated with the exception of one control. A second treatment was given 15 days later followed by good care and nursing. The treated calves picked up wonderfully after, the egg count falling considerably lower in the treated than in the control.

Another calf badly infested with worms (the species not being determined) and unable to get up, after a single treatment good feeding and by life under hygienic conditions showed physical improvement. A photograph of this animal before and after treatment is reproduced.

—*Cornell Veterinarian*, (Conference number) Vol. XXIX, April' 39.

Treatment of trichostrongyles in foals, BY D. W. BAKER, A. G. DANKS AND J. W. BRITTON. The authors report the successful treatment of six pure bred Belgian and Percheron foals between the ages of 9 and 13 months, ather heavily infested with *Trichostrongylus axei*, by giving the 1 per cent copper sulphate and 1 per cent nicotine sulphate solution recommended for bovine and ovine trichostrongylosis. After a preliminary starvation of 12 hours, 300-325 c. c. of the mixture was administered through a stomach tube, which was well tolerated without any toxic symptoms. The response to treatment was judged by the great reduction in the infective larvae of *Trichostrongylus* species in faecal cultures after treatment. The stomach worm infective larva may be distinguished from the horse strongyle larva by the absence of a tail in the former.

—*Cornell Veterinarian* Vol. XXIV. R 238

Studies on bovine gastro-intestinal parasites. I. The mode of infection of the hookworm and nodular worm. BY ROY L. MAYHEW.

In the programme of parasitic control of the hookworm *Bunostomum phlebotomum* and the nodular worm *Oesophagostomum radiatum* of cattle the author stresses the importance of taking the places where cattle, especially calves, lie down, such as the shade and the barn and barn lot, into consideration as cutaneous infection by these worms appear possible in the experiments he happened to conduct.

A controlled experiment is reported which indicates that cutaneous infection occurs with the larvae of the hookworm *Bunostomum phlebotomum* in the calf. Four preliminary experiments suggest cutaneous infection although licking of larvae from the hair may have occurred.

Four instances of cutaneous infection with nodular worm larva are recorded in three calves. An additional experiment, in which the infection may have been either cutaneous or oral or both, is described.

Two experiments are described in which no precautions were taken to prevent the calves licking the larvae from the hair but otherwise conducted under controlled conditions of infection.

The author relates further, his experience of the infection with nodular worms that was obtained only after the sixth application of infective larvae while nothing resulted in the first five; that infection with hookworm failed to result after two applications of infective larvae in another case and that sometimes no results are obtained when larvae appear in perfect condition and cultured in the regular manner are given by mouth.

It is significant to note that when an infection with the nodular worm could be attributed to any one definite application of infective larvae it was always followed by a dermatitis of a mild or severe degree.

New born calves free from parasites and raised under conditions to prevent extraneous infection were used in all the experiments. Each calf was thrown down, the legs tied securely before the skin inoculations were made in the same general manner. The infective larvae in a small amount of clean water, were poured on to the unshaven skin of the flank, a small quantity at a time and worked into the hair with the hand; the area of skin was then kept warm and moist by gentle pressure of the hands for 15-30 minutes. The animal was then untied and placed for different periods of time as stated in each experiment, in a wooden stanchion, not of the swinging type, that would not permit the calf to reach and lick any part of the body.

The Cornell Veterinarian Vol. XXIX No. 4. October 1939

Extract

Over a number of years a considerable amount of work has been done on Kumri. We have never succeeded in transmitting the disease to horses or other animals, and we have never been able to confirm the work of Shirlaw and others in India. Nevertheless, much information about the diseases has been collected, and the following summary based mainly on notes by Mr. Brown may now be reported.

In the numerous post-mortem examinations that have been done on cases of Kumri lesions found have been scanty and in many instances apparently insignificant. All the horses that were killed were typical cases of Kumri as the disease is seen in Burma, i.e., they showed varying degrees

of posterior inco-ordination. The only other symptom shown was an increased sexual desire in some mares. None of them exhibited symptoms indicating cerebral damage, in fact apart from the posterior inco-ordination the animals were healthy. Two mares suffering from Kumri have been kept under observation for four years and during this period have remained healthy and have bred several foals. The paraplegic symptoms are still present but have become less severe probably as a result of new reflex paths having been set up which are now partly replacing those destroyed during the course of the disease. The complete absence of muscular atrophy is an indication that the peripheral nerves are not involved.

Some of the horses were destroyed by pithing to avoid damage to the brain, the others were shot. The only organ in which macroscopic lesions were consistently found was the spinal cord. Most of the mares had cystic ovaries, and these were probably associated with the increased sexual excitement; fertility seemed unaffected as two were in foal when destroyed, and others had bred foals after contracting Kumri. In some cases there was a thick gritty deposit on the mucous membrane of the urinary bladder; the mucosa itself appeared normal. Gastro-intestinal parasites were sometimes very numerous, and most horses had a fairly heavy infestation of them. No schistosomes were found in any of the animals.

The lesions in the Nervous System.—In every post-mortem examination the brain and spinal cord were exposed and examined. When material for sub-inoculation experiments was required parts were removed immediately the brain and cord had been exposed, and then their examination and the collection of representative parts for fixation and histological study was done. The brain was removed and examined away from the carcase; the spinal cord was first examined in situ in the spinal canal after the dorsal parts of the vertebrae from the atlas to the coccyx had been removed. The dura mater was slit along the whole length of the cord and laid open and then the lesions could be felt by running the fingers down the cord on its dorsal surface. They consist of one or more soft spots in the substance of the cord. There is no outward sign of a break in the continuity but the soft area can be felt to be sharply demarcated at each end. The soft spots vary from a few millimetres to three centimetres in length, and several may be present. They have been seen in all parts of the spinal cord, except that of the cervical region. The lumbar part of the cord is apparently the first affected, as in mild cases where only one softening was seen, it was always in the lumbar part of the cord; where several softenings were found, one or more were in the lumbar part, and others in the thoracic part. The largest area of softening seen was a solitary one in the lumbar part of the cord of a fairly recent case of Kumri. It was slightly over three centimetres in length. The soft areas in the lumbar part of the cord were always large ones, and those in the thoracic part were small, some a mere "nick" in the cord. No macroscopic changes in the meninges were seen over the softened areas or at any other site.

Sections through the soft spots showed varying degrees of disorganisation and change in appearance of the grey matter of the cord. As a rule, the bigger the soft spot, the more obvious the deformity of the grey matter on cross section of the cord. The symmetrical butterfly pattern of the grey

matter is altered by a decrease in size of one or both of the lateral crescents, almost always more noticeable in their anterior rather than their posterior horns.

The lesions in the grey matter do not, of course, account for the softening of the cord: the actual cause of this had to be sought in the white matter, and in only a few cases was there clear macroscopic evidence of degeneration of the white matter. In cross sections of these the white matter showed a few small localised areas which differed slightly in colour from, and had a more glistening appearance than, the rest of the white matter. On slight pressure a few drops of a thick gelatinous fluid exuded from the cut surface. The alteration in colour was sometimes seen more clearly after formalin fixation.

No macroscopic lesions were seen in the brain or its membranes.

Histological Examination.—Sections were cut from all internal organs and from selected parts of the central nervous system. Routine histological stains were used for all sections, and selective stains were also employed in the brain and spinal cord material to demonstrate neuroglia, myelin sheaths, Nissl bodies, etc.

Specific lesions were demonstrated in the spinal cord, and changes were also seen in the cerebellum and the kidneys. In the kidneys they consisted of a sclerosis of the arterioles, the lumina of which were often greatly decreased by the thickening of the vessel walls. Hyperaemia was usually present and in a few sections localised distensions of the venous spaces between the renal tubules were seen. These lesions of the kidney were by no means constant in all cases examined: in some they were very slight and in a few they were absent.

The histological changes in the spinal cord were seen in sections of the softened parts of the cord: no lesions being seen in sections from other parts. They consisted in the grey matter of degeneration and varying degrees of neuronophagia of the neurons, punctate haemorrhages, and lymphocytic infiltration; and in the white matter of localised areas of partial demyelination. The neuronophagia appeared to be a very gradual process, and even in very recent cases was not extensive: in many sections all the neurons were normal. Its first stage was a shrinking of the neuron and disorganisation of its internal structure. Next, the cell became more acidophilic, had lost its triangular shape and had shrunk to a more or less circular body with a layer of chromatin around its edge, to which were attached a few mononuclear cells. Some of these later invaded the cell which further diminished in size until it completely disappeared. A clear space was often seen around the degenerating neuron, where proliferating glial elements had not yet filled up the space left by the disappearing cell. Though they were not confined to it, many of the affected neurons were in the anterior horn of the grey matter; a few were seen in the posterior horn.

The punctate haemorrhages were small and had occurred as a result of the rupture of small blood vessels traversing the grey matter. Small vessels were often seen distended with blood where rupture had not yet taken place. The lymphocytic infiltration consisted of a sparse scattering of

lymphocytes throughout the grey matter : they tended to be more frequent near the site of destruction of a neuron.

In the white matter the areas of demyelination were demonstrated by osmic acid stains. The disappearance of the myelin sheaths was partial and was seen as a decrease in thickness and poor staining affinity of the sheaths surrounding some fibres of the crossed pyramidal tracts, where slight sclerosis was also present.

In the cerebellum slight neuronophagia and lymphocytic infiltration were seen in several cases. No lesions were demonstrated in the cerebrum or other parts of the brain.

Pathogenesis of Kumri.—Lesions are first initiated in the neurons of the spinal cord and cerebellum by the action of the infective agent or toxin. A chronic irritating action sets up a low grade inflammation which results in slow destruction of some neurons by a process of neuronophagia. The neurons lose their extra cellular processes, shrink, become invaded by mononuclear cells, and finally disappear, leaving a space which is filled up by proliferative glial elements. Localised hyperaemia and a few haemorrhages occur in the regions where nerve cell destruction is going on ; and a space infiltration with lymphocytes appears. The axon fibres cannot survive when their parent neurons are destroyed, and those which originated from affected neurons undergo demyelination and degeneration. They are replaced by neuroglia and appear as sclerotic areas in the white matter of the cord.

No definite regional correlation has been established histologically between the neurons affected and the symptoms observed ; the peculiar selectivity of the causal agent in attacking in every case neurons whose destruction gives rise to closely similar symptoms is remarkable. Nerve paths normally carrying impulses of voluntary movement to the posterior part of the body are destroyed and inco-ordination results. In clinical cases, where the inco-ordination appears suddenly the destructive process has started simultaneously in a number of neurons and their nerve paths become non-functional at about the same time.

At a certain stage the process of neuron destruction ceases and the disease becomes static. The degenerated axon fibres of the cord, lacking the cellular sheath which peripheral nerves possess, cannot regenerate and return of function is impossible. In horses with mild symptoms an improvement in function occurs after a long period ; new reflex paths have been set up in other nerve fibres and these restore to some extent normal function.

Aetiology.—No experimental evidence has been obtained to indicate the presence of a virus, although such a causal agent is suggested by the histological findings. Sub-inoculations, the majority by the intracerebral route, of pooled brain and cord suspensions into mice, guinea pigs, rabbits, dogs and horses have failed to transmit the disease. No conclusive results have been obtained from attempts to cultivate a virus upon the chorio-allantoic membrane of the developing chick.

Shirlaw in India has reported successful transmission of Kumri to laboratory animals but his work could not be confirmed in Burma. This

worker's histological results also differed slightly from those at Insein, as perivascular infiltrations (cuffing of blood vessels) were a feature of his cases, and this lesion was not observed here. Most of his cases were clinically far more acute and severer than those seen in Burma, and cerebral involvement was the rule rather than the exception in them : this has never been seen in Burma. It is probable that the Indian cases are a different condition ; certainly they were more acute and severer than the characteristic partial paraplegia which is known as Kumri in Burma. Perhaps the virus had already disappeared from the body in the Burma cases by the time the disease was diagnosed and the animal destroyed to obtain material for sub-inoculation.

No bacteria have been demonstrated in Kumri cases. A fodder or poisonous plant intoxication cannot be excluded although the histological lesions are more suggestive of a virus infection.

*" Report of the Civil Veterinary Department Burma,"
(For the year ending 31st March 1941).*

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Vol. XVIII

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No. 6

General Articles

**JOHNE'S DISEASE: TEN YEARS' OBSERVATIONS ON AN
EXPERIMENTAL HERD.***

BY

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THIS herd was constituted in 1929 mainly with the following objects :
(a) To observe whether under the conditions existing at Mukteswar the disease would spread from infected to healthy cattle, (b) to study the effect of treating a proportion of the animals with a live vaccine according to the method of Vallée and Rinjard (1926).

General Description Of The Experiment

The herd was started in a shed in the main Institute area but after about a year the survivors were transferred to a particularly secluded out-kraal in the forest area of the Mukteswar Institute where the remainder of

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* The investigation recorded in this article was initiated, at the instance of the senior author, by the late Mr. H. Cooper, M.R.C.V.S., and carried through with the help of several other members of the staff of the Institute, to whom acknowledgments are due.

The compilation of the data and the writing of the paper has been carried out by the junior author with the assistance of Dr. F. C. Minett, who also made the final tuberculin and Johnin tests.

the experiment was carried on. This kraal situated at an altitude of 6,125 feet consists of an area of land just less than $\frac{1}{4}$ acre in extent, gently sloping from south to north, and is bounded by a wire fence. The soil is sandy and except in certain spots there is little tendency for rain to collect even during the monsoons. Seasonal variations in temperature are: November to March, min. 23°-37° F., max. 57°-66° F; April to July, min. 36°-52° F., max. 72°-80° F. The average annual rainfall is about 50 inches of which 20 to 25 inches fall during the summer monsoon from July to September. In April-June the daily average sunshine is about 12 hours, while in winter the average snowfall calculated as rain is 7 inches. The main shed measuring 40 by 12 feet usually housed 30 to 35 cattle of various ages and there was also a smaller shed. Both were ill-ventilated, with rough paved floors, and were used for housing the animals at night. During the day the animals were allowed to roam at will in the kraal, as well as in the adjoining forest for purposes of grazing. In fine weather they remained in the forest from 8 A.M. till 3 P.M. The calves were kept with their mothers and were not weaned, and the cows were not milked. On return from grazing the animals were given a diet of hay or grass and a little concentrate mixture (crushed gram, wheat bran, oil cake and salt). The roughage was fed on the floor of the sheds. Water was supplied from an iron tank filled from a stream running down the hillside and during the early part of the experiment drainage water from the sheds was also allowed to run into the tank. The cleaning of the sheds and of the outside enclosure was purposely not thorough and the floor of the sheds became slushy at the time of the rains and snow. All calvings took place in the same sheds, along with other animals. It was thought that these conditions in the sheds would give the infection every chance of spreading to the healthy animals, but it will be observed that the animals in other respects led a very natural life, were given a reasonably adequate maintenance ration and were not subjected to any physical strain, except at the time of calving. From time to time, the animals were tested by the double intradermal method with ordinary tuberculin and with avian tuberculin. Both tuberculins were prepared from glycerol broth cultures and were used in the heat-concentrated form. Finally, in April 1940, a test was made with ordinary tuberculin and Johnin, in both cases ammonium sulphate precipitated products from synthetic media and prepared in the Medical Research Council Laboratories, Mill Hill, England. From time to time also rectal smears and bowel washings were examined in a further attempt to locate infected animals. All animals which died or were destroyed were examined for Johne's disease by making microscopical preparations from the bowel wall, particularly from the terminal portion of the ileum and from the ileo-caecal valve. At the conclusion of the experiment selected animals were slaughtered and attempts made to cultivate Johne's bacilli on a liver extract-*phlei*-egg medium:

Composition Of The Herd

The herd has been gradually built up of (a) naturally infected cattle from outside, and (b) healthy cattle, and its numbers have been augmented by the progeny of these two groups of animals. Breeds represented were: Tharparkar, Hissar, Bihar, Assamese, Sindhi and cross-bred. The size of the herd increased from 3 in August 1939 to 110 in April 1940, when the experiment was closed. (Although the total number of animals passing through the herd has been stated as 110, only 95 are mentioned in Appendices 1 and 2, the remainder having either died or been killed as calves by wild animals.)

In August 1929 there were purchased from Bihar three naturally infected cows (Nos. 1, 2 and 3), all three being typical cases of Johne's disease in which acid-fast organisms could be easily demonstrated in rectal smears and faeces. The animals reacted to avian but not to ordinary tuberculin. Two of these cows (Nos. 2 and 3) died a few months later in spite of treatment with formalin and Johne's bacilli were isolated from both of them. The third cow (No. 1) attained good condition and ceased to react to avian tuberculin, although rectal smears were teeming with acid-fast organisms resembling Johne's bacilli. She died in May 1931 of Johne's disease.

A second batch of 9 cows (Nos. 4-10, 61 and 62), 1 calf (No. 11) and 2 bullocks (Nos. 12 and 13) were received from Bihar in 1930. All these animals, as well as cows 1, 2 and 3, were accommodated temporarily in a shed in the main Institute area and were transferred during 1930 to the out-kraal. All of the second batch of animals, except the calf (No. 11) which was not tested, had been declared infected as a result of an avian tuberculin test at the farm or origin. On arrival at Mukteswar they were retested with avian tuberculin and all except two (cow 5 and calf 11) reacted. Bowel washings from all these animals, except calf No. 11, showed acid-fast bacilli which were regarded as those of Johne's disease. They were subsequently tested at intervals with avian tuberculin with varying results. The two bullocks were proved at *post mortem* examination in June 1931 to have been infected with tuberculosis and Johne bacilli could not be isolated. Of the remaining animals, 7 cows and the calf are dead and the remaining two cows (Nos. 61 and 62) were still alive and in fair condition at the close of the experiment. At *post mortem* examination Johne's disease was confirmed in 4 of the 7 cows (Nos. 4, 7, 8 and 10) and in the calf which was then 2½ years old. Of the other 3 cows, one (No. 5) was a tubercular subject while in two of them (Nos. 6 and 9) neither tuberculosis nor Johne's disease could be confirmed.

In July 1930 a cow (No. 14) which had reacted strongly to avian tuberculin and weakly to ordinary tuberculin was received from the Central

Provinces and on *post-mortem* examination Johne's disease could not be verified.

In July and September 1937 there were received from Assam 18 animals (4 cows Nos. 15, 16, 63, 64; 14 bulls and bullocks Nos. 17-26 and 65-68). Four of these (cows Nos. 15 and 63 and bulls Nos. 18 and 30) had been declared positive reactors to avian tuberculin and the remainder were regarded as infected with Johne's disease. Of these, 14 are dead or destroyed (2 cows and 12 bulls or bullocks); 3 of them bulls Nos. 17, 19 and 22 were proved to be infected with Johne's disease, but the disease was not confirmed in the remaining 11 animals at *post mortem* examination.

At intervals between September 1930 and 1938, 23 animals (16 cows and 7 bulls) from the Institute Dairy were added, as they were suspected for Johne's disease. Of these, 21 are dead or have been destroyed with the result that 13, (11 cows and 2 bulls) were confirmed as cases of Johne's disease and 8 (3 cows and 5 bulls) were apparently healthy. The remaining 2 cows are alive and in good condition.

Finally, there have been born into the herd 53 calves. Of these animals 30 died or were destroyed between August 1930 and May 1940. Twelve of them (Nos. 11, 46, 47, 48, 49, 53, 54, 55, 56, 57, 94 and 95) were proved to be infected with Johne's disease when they came to *post mortem* examination at ages varying from 1 to 7 years, while the remaining 18 were apparently healthy. The other 23 (5 males and 18 females) are alive and in good condition.

Effect Of Calving

In some of the clinical cases the effect of calving was considerable. For example, 5 cows (Nos. 2, 3, 28, 29 and 32) died 1-5 months after calving. Though cow No. 6 died two months after calving in a very poor condition she was negative for Johne's disease at *post mortem*.

Vaccination

From 1930 onwards every other calf born into the herd was injected subcutaneously in the neck with living Johne bacilli from culture (Vallée and Rinjard, 1926) the injection being made within 24 hours of birth. In most cases the vaccine was prepared from a stock culture of the organism grown on a *phlei*-agar medium. Until 1933 each animal vaccinated was given 25.0 mg. culture suspended in 2.5 c.c. saline. From 1934 to 1940 the same amount of culture was mixed with 600.0 mg. sterile and suspended in 2.5 to 5 c.c. liquid paraffin or vaseline oil. As expected, this produced an extensive firm and lasting swelling whereas there was no enduring local reaction to the saline suspension of bacilli. The fate of vaccinated animals and of the unvaccinated controls is summarized in Appendix 3. It will be

seen that of 8 calves vaccinated with the saline suspension 3 developed Johne's disease while of 8 unvaccinated animals 4 became infected. Of 14 calves vaccinated with live bacilli mixed with the unabsorbable recipient one developed Johne's disease, while 2 out of 13 controls became similarly infected.

Results Of Tests

Out of 60 animals in Appendix 2 (a), 46 reacted strongly or weakly to avian tuberculin at least once during the period of observation and of these 46 reactors, 24 were confirmed as cases of Johne's disease. Out of 14 animals which did not react to avian tuberculin, 9 were positive for Johne's disease. Ten out of 60 reacted to ordinary tuberculin but only 4 of the 10 had microscopic lesions to tuberculosis.

Discussion

At the time this experiment was started more than ten years ago no knowledge was available as to the ease or difficulty with which the disease might be disseminated. There was, however, a feeling that in view of what is known to happen on infected farms, spread might occur rather easily. Actually, as described above, the converse was the case, the disease dying out although apparently given every chance to spread. On reflection, however, and in the light of the present knowledge on the subject of epidemiology and the influence of environment on the spread of disease, it is clear that the events in an experimental herd such as this were bound to be complex and difficult to interpret. In what follows, some attempt is made to analyse the position.

It may be noted in the first place that the herd was made up of animals received from different places, at different times and in various stages of infectivity. In the various groups of animals received and examined at *post mortem* the proportion found to be infected was as follows: Bihar 8 out of 13, Assam 3 out of 14, Mukteswar Dairy 13 out of 21, while out of 30 calves born into the herd 12 acquired infection. Two animals of Bihar, 4 of Assam, 2 of the Mukteswar Dairy and 23 born into the herd are alive and in good condition. Thus during 10 years 1930 to 1939, 36 known infected animals were added to the herd, *viz.* in each year, 4, 3, 4, 4, 1, 2, 7, 5, 1 and 5. Four of these were destroyed and 32, including the 12 calves, died. In spite of this, judging from the final tuberculin and Johnin tests carried out in April 1940 the disease had failed to extend. In April 1940, 33 animals, other than very young calves, were available for test, *viz.* 2 cows from Bihar, 6 animals from Assam, 4 cows from Mukteswar Dairy and 21 animals born in the herd of which 12 had been vaccinated. The only ones to react were the vaccinated animals. Following this test 6 animals (Nos. 67-70, 76 and 88) taken at random from the non-reacting group, were

slaughtered and a careful examination of the intestine by microscopical and cultural methods failed to show any evidence of Johne's disease.

In seeking to explain the facts, two questions for consideration are the susceptibility of breeds of Indian cattle and the possibility of infected animals recovering under certain conditions. There is no record of experiments having been carried out on the susceptibility of Indian cattle to Johne's disease, but the disease has been reported from a number of provinces and it may be presumed that as with other cattle susceptibility is greatest in early life. M'Fadyean and Sheather (1916) for instance found that many individuals of the bovine species offer a marked resistance to infection with Johne's disease, that calves under 6 months take the infection more readily and that by 6 months of age calves are already becoming more resistant.

With regard to the second question, it is still uncertain whether complete recovery—in the sense of destruction within the body of all Johne's bacilli—occurs, but it is well known that apparent recovery *i. e.* recovery in the clinical sense occurs quite commonly when the environment (housing, feeding, climatic factors) is favourable. Thus, months or even years may elapse before symptoms appear in Johnin reactors, while in infected European cattle after the age of 5 years there develops an immunity which in some animals is strong enough to prevent any marked decline in condition for a number of years.

Hagan and Zeissig (1933) record the remarkable instance of a cow, experimentally infected by feeding, which showed severe symptoms of Johne's disease and was in fact judged to be at the point of death but which improved and gradually reached normal condition, at the same time becoming a non-reactor to avian tuberculin, though still continuing to react to the complement fixation test. At autopsy, however, it was found that infection had not been eliminated since lesions and the characteristic bacilli were present in the ileum and ileo-caecal valve. It is perhaps not unreasonable to think that this animal might have recovered completely had she been allowed to live long enough. And if an occasional advanced case of the disease may recover, it is not unlikely that animals exposed to natural infection may often contract the disease and recover without reaching the advanced stage in which symptoms are produced.

That apparent recovery may take place in Indian cattle is suggested by Cooper and Srinivasan (1931) who observed that a number of cattle sent from Bihar to Mukteswar as suspected cases of Johne's disease owing to poor condition, diarrhoea and reaction to avian tuberculin, improved greatly when subjected to good housing and liberal feeding. Within 2 months all diarrhoea had stopped and it was then very difficult to realize that they were still infected with Johne's disease. Whether these were examples

of true recovery cannot be stated, and in the present herd no proof of real or complete recovery has been obtained, but the issue is often confused by the difficulty which is experienced, firstly in making a diagnosis at all in this disease and secondly, after making a positive diagnosis, in obtaining confirmation at *post mortem* examination. In this connection it is of interest to note that although several of the animals shown in Appendix 1 (Nos. 6, 9, 12, 13, 14, 38 and 68) are recorded as having shown acid-fast organisms in faecal or rectal smears, these were not recovered later at *post mortem* either by microscopical or cultural examination. Serial No. 44 in the same appendix was artificially infected intravenously with a dose of pure culture of Johne bacilli and gave 3 positive reactions to the avian tuberculin test, yet on *post mortem* examination acid-fast organisms were not recovered.

Another point to be considered is the comparative value of avian tuberculin and of Johnin, applied by the double intradermal method, for the diagnosis of this disease. As noted above, in this work out of 46 reactors to avian tuberculin 24 were proved to be positive for Johne's disease, while out of 14 non-reactors, suspected of Johne's infection on other grounds, 9 were found to be positive. With regard to Johnin there are a number of observations in the literature. Reference to some of these is given by Minett (1933, 1935) who has also reported on the value of a synthetic Johnin for the diagnosis of Johne's disease in cattle. In a series of 53 animals which had reacted to the double intradermal method of testing, 39 were proved to be infected on *post mortem* examination, while there was presumptive evidence of this infection, either from *post mortem* examination or from the history of the case, in eleven of the remaining 14. Repeated tests on a number of the animals in this series showed much variation in the degree of local response to Johnin, a result which was attributed to variations in the allergic state. A few other cattle which were at an advanced stage of the disease did not react.

The vaccination experiments in the Mukteswar herd were started with the possibility in mind that the disease would spread easily and that in this way the value of vaccination might be judged. Unfortunately, since the disease did not spread and the number of calves available for vaccination was small, no conclusion can be drawn as to the usefulness or otherwise of the method and the second object of the work in the experimental herd was therefore not achieved.

The question may be asked finally in what way the conditions of the present experiment differ from those cases in which the disease seems to spread without hindrance. The favourable conditions under which the animals in this experiment were maintained have already been referred to and it seems probable that under good farming conditions the disease spreads easily only (a) when there is a high level of infective material within a

restricted space, (b) when the level of the host susceptibility is high, as when there is a high proportion of very young animals. With the present herd an attempt has been made to estimate the chances at different times of healthy animals acquiring infection by preparing a list of (a) the number of infected animals in January and July in each year and their status as regards clinical or latent infection and (b) the number of healthy or presumably healthy contacts and their age on the same dates. The ratio of (a) to (b) would clearly be a means of judging the chances of spread at different stages of the experiment. The actual results of this enquiry are not detailed here but it is strongly suggested that the danger of infection spreading could at no time have been great, in view of the high average age of the contacts and the paucity of animals suffering from the disease in clinical form. Under these circumstances some 75 per cent of the animals at the most susceptible age escaped infection. The results of the Mukteswar experiment are in general accord with those of Hagan and Zeissig (1933) who found in their six years' experiment of a herd experimentally infected with Johne's disease that even under conditions of severe exposure a considerable number of animals failed to contract the disease naturally.

Summary.

An account is given of a herd of cattle maintained at Mukteswar for a period of 10 years to determine the chances of Johne's disease spreading amongst them. Although a number of naturally infected adult animals died of the disease and although some 25 per cent of the calves born in the herd also became infected and died, there was no general spread of infection under the conditions there prevailing and at the termination of the experiment Johnin testing of the whole herd and *post mortem* examination of 6 animals selected at random indicated that the disease had disappeared.

It seems, therefore, that in practice there is no great danger of Johne's disease becoming established in a well-managed herd, unless there is a high initial level of infection in a restricted space, and a relatively large proportion of highly susceptible, *i.e.*, very young animals, are present.

[The article is supplemented by three appendices containing history of animals belonging to the experimental herd; results of tests with ordinary and avian tuberculosis, vaccination results. For want of space, we regret, they could not be published. *Ed.*]

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THE NUTRITIONAL DEFICIENCY DISEASES OF CHICKENS *

BY

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FEEDING CHICKENS a ration which is lacking or greatly deficient in one or more of the essential nutritive substances frequently causes the development of morbid processes with characteristic symptoms. Such morbid processes are called nutritional deficiency diseases. With the exception of perosis, resulting usually from manganese deficiency, and hyperplastic goiter, resulting from iodine deficiency, all of the known nutritional deficiency diseases of chickens are due to the feeding of rations inadequate in certain specific vitamins. They are made evident by retarded growth, loss of weight, rough feathering, lameness, paralysis, convulsions, hemorrhages, tissue degeneration and other abnormalities.

Nutritional Deficiency Diseases Caused By A Lack Of

Fat-Soluble Vitamins.

The fat-soluble vitamins required by chickens are vitamin A, vitamin D, vitamin E (α -tocopherol), vitamin K and the anti-gizzard-erosion factor. A deficiency of any of the vitamins in the ration results in the development of characteristic symptoms.

Vitamin A is a colourless compound found only in animal tissue. Fish oils generally contain only true vitamin A while in butterfat both true vitamin A and carotene are present. Carotene and several of the other carotenoid pigments are known as provitamin A or the precursors of vitamin A. These pigments are converted into true vitamin A in the liver of the chicken. They are present in fresh green grass, alfalfa meal, yellow corn, certain vegetable oils and other materials.

A lack of vitamin A in the ration of chickens results in slower growth, lowered disease resistance and increased mortality. The secretions of the intestinal mucous glands, the salivary glands and the tear glands fail. The margins of the eyelids become granular. Infection may occur, resulting in the production of viscous fluid which frequently causes the eyelids to stick together. Vitamin A deficiency also may be manifested by the presence of creamy white pustules in the roof of the mouth and along the esophagus.

* From the Department of Poultry Husbandry, Cornell University; presented before the Section on Poultry at the 77th annual meeting of the AVMA, Washington, D. C., August 26-30, 1940. Reprinted from: J.A.M.A., March 1941.

Urates accumulate in the ureters and in the tubules of the kidneys so that these organs are enlarged and pale. The nervous mechanism is affected in many instances with the result that afflicted chickens walk in a wobbly, zigzag manner. When the eyes are badly affected, vitamin A deficiency in chickens is sometimes called xerophthalmia. It also has been called "nutritional roup."

Vitamin D exists in at least ten forms, two of which have been identified chemically. One of these is called irradiated ergosterol or calciferol and the other irradiated 7-dehydro-cholesterol. The latter form of vitamin D appears to be just as effective, rat unit for rat unit, for feeding chickens as the vitamin D of cod liver oil, while the former is at the most only about one twentieth as effective. For this reason irradiated ergosterol is rarely, if ever, used in poultry rations. The chief sources of vitamin D for feeding chickens are cod liver oil, tuna liver oil, sardine oil and other fish oils.

A lack of vitamin D in poultry rations, in the absence of exposure to direct sunlight, results in the development of rickets. In this disease an upset occurs in the mechanism involving the absorption and retention of calcium and phosphorus as a consequence of which these minerals are not deposited in the bones, or only to a slight extent. Rickets in chickens is characterized by a stilted, stiff-legged gait and an ungainly manner of balancing the body. Enlargement of hock joint, beading of the rib ends, spinal curvature and crooked breast bones also may develop. In hens lowered egg production, the laying of thin-shelled eggs and failure in hatchability occur as well as rickets.

In chickens a diagnosis of rickets is readily made by dissecting the tibia, splitting it longitudinally at the distal end and examining the metaphysis by means of an appropriate procedure. In extreme rickets a typical broad rachitic metaphysis develops with an irregular line of demarcation between it and the diaphysis.

Vitamin E in a pure state is a white, crystalline compound possessing the chemical name, α - tocopherol. It is found in cereals, wheat by-products and leafy green plants. Wheat germ oil is especially rich in this vitamin. It is readily destroyed by the products of the chemical reactions which occur in the development of rancidity in fats and oils.

A prolonged deficiency of vitamin E causes poor fertility and hatchability by producing sterility in the male fowl and reproductive failure in females. The deficiency causes the development of degenerative changes in the testes of the male which may result in complete testicular atrophy, thus rendering the bird permanently sterile. In females only the capacity to produce eggs that will hatch is affected. During incubation the rate of growth and differentiation of the embryos are slow and some embryos die

during the first two days due to a failure of the circulatory system. A critical period in the development of the embryos occurs about the fourth day. Embryos which survive the early critical stages are frequently subject to hemorrhages and other abnormalities.

The recent experimental work showing that synthetic vitamin E prevents the development of nutritional encephalomalacia points to the conclusion that it is a manifestation of a deficiency of this vitamin in chicks. Chicks afflicted with this nutritional deficiency disease suddenly become prostrated, lying with legs outstretched and spastic and toes flexed. The head is retracted and often twisted laterally. Before becoming completely prostrated the gait and other movements are often incoordinate. Upon autopsy lesions are found in the cerebellum and sometimes in the cerebrum. In many chicks necrotic reddish or brownish areas can be seen by inspection upon the surface of the cerebellum. Small hemorrhages, upon sectioning the cerebellum, may be found in the central white matter. In chicks fed on low-fat rations the symptoms of vitamin E deficiency appear to be subcutaneous edema and edema of the heart and pericardium rather than necrosis of the brain.

Vitamin K is a colorless compound the chemical formula of which was determined during the past year. It is present in fresh green plants, alfalfa meal, meat scrap, fish meal and other animal by-products. It is readily formed in animal products by bacterial action. A number of somewhat simpler but related chemical compounds have been found to have vitamin K activity.

A lack of this vitamin greatly delays the clotting time of the blood, and chicks fed a deficient ration bleed to death from any injury or bruise which causes rupture of blood vessels. Hemorrhages may occur subcutaneously, intramuscularly and intraperitoneally, and in any part of the chick's body. The hemorrhages vary in size and appear as the only symptoms of a deficiency of vitamin K. In chicks fed a vitamin-K free ration they occur at from 5 to 14 days of age, depending upon the amount of the vitamin contained in the egg. The mortality is frequently high.

The Anti-gizzard-erosion factor has been claimed to be fat-soluble by one group of investigators and non-fat-soluble by another group. It is possible that more than one factor is involved in the prevention of gizzard erosions. Chondroitin, a constituent of cartilaginous tissue, has been reported to prevent gizzard erosions, and also the saponifiable fraction of the fat of alfalfa. It also has been shown that cholic acid of the bile is an effective preventive agent. It may be that in order to maintain the gizzard in a normal state, the production of bile by the liver is involved.

The anti-gizzard-erosion factor is so referred to because a deficiency of this factor in the ration causes a gizzard disorder characterized by swelling and necrosis of the secreted lining of the gizzard. Eroded, crater-like lesions frequently develop. They have been observed in chick embryos as early as 11 days and in day-old chicks. Growth does not appear to be affected by a deficiency of this factor. Undersized gall bladders have been observed in chicks suffering from gizzard erosions.

Nutritional Deficiency Diseases Caused By A Lack Of Water-Soluble Vitamins.

The water-soluble vitamins required by chickens are vitamin B (thiamin), vitamin G (riboflavin), Vitamin B₆ (pyridoxin), the antidermatosis vitamin (pantothenic acid) and a number of other factors which have not yet been isolated and identified chemically. A deficiency of all the known water-soluble vitamins required by chickens results in the development of nutritional deficiency diseases and several of those not yet identified are reported as resulting in the development of characteristic symptoms.

Vitamin B in a pure state is a colorless, crystalline compound possessing the chemical name, thiamin. It is present in fairly large amounts in cereals, wheat by-products, milk by-products and fresh green plants. The germ of cereals and dried yeast are specially rich in this vitamin.

A lack of vitamin B causes loss of appetite, emaciation, impairment of digestion, general weakness and frequently convulsions. The disease in chickens is known as polyneuritis. Day-old chicks, placed upon a vitamin-B free ration, develop polyneuritis within nine to twelve days. The symptoms of vitamin B deficiency in chicks and in mature birds are similar.

Vitamin B₆ is a white, crystalline compound which has only recently been identified chemically. It has been given the chemical name, pyridoxin. The cereals, wheat by-products, cane molasses and dried yeast are good sources of vitamin B₆.

It was not known until the past year that vitamin B₆ is required by chickens. The symptoms of a deficiency of this vitamin are reported to be slow growth, depressed appetite and inefficient utilization of food followed in some cases by spasmodic convulsions and death. An abnormal, jerky gait is occasionally shown. The symptoms resulting from a deficiency of vitamin B₆ are apparently somewhat similar to those caused by a deficiency of vitamin B.

Vitamin G is a yellow, crystalline compound bearing the chemical name, riboflavin. When it is exposed to blue and ultraviolet light, it fluoresces green. It is readily destroyed by these rays of light. Good sources of this

vitamin for feeding chickens are milk by-products, fresh green plants, alfalfa meal, dried liver, dried yeast and certain by-products of the fermentation and distilling industries.

A lack of vitamin G causes growth failure and a high mortality in chicks. Besides these effects a curious paralysis develops which is sometimes called "nutritional leg paralysis". It involves the legs and feet only and occurs in two stages: a preliminary stage which is curable and a chronic stage which is incurable. Nutritional leg paralysis is characterized by the sudden appearance of chicks walking on their hocks with the toes curling inward. The chicks otherwise seem to be in excellent health. Chicks fed a ration only partially deficient in this vitamin often recover spontaneously. The severe cases of the paralysis show marked hypertrophy and softening of the sciatic and brachial nerves which are usually discernible by inspection. These symptoms are most pronounced and most often observed in the sciatic nerve. The nerves occasionally reach a diameter of four to five times their normal size.

In mature chickens a deficiency of vitamin G results in poor hatchability and high embryonic mortality. The requirement for hatchability is considerably higher than that for egg production and maintenance of health. Embryologic studies of the eggs of hens fed a diet very low in this vitamin have shown that "nutritional leg paralysis" is present in 19- to 20 day-old embryos which died at that time. Myelin sheath degeneration of the sciatic nerves of these embryos has been observed.

The anti dermatosis vitamin, frequently called the filtrate factor or chick anti-pellagric vitamin, has been shown within the past year to be pantothenic acid, a factor essential for the growth of yeast and certain bacteria. It has been synthesized recently and its correct chemical formula is now known. Pantothenic acid is widely distributed in nature. Cane molasses, liver meal, dried yeast, peanut meal and milk by-products are among the better sources of this vitamin

When pantothenic acid is lacking in the diet, chicks grow slowly and feather development is extremely ragged. Within 12 to 14 days a pellagra-like syndrome develops. The eyelids become granular and stick together as a result of the production of a viscous exudate. Crusty scabs appear at the corners of the mouth and sometimes around the vent. The skin on the bottoms of the feet often becomes thickened and cornified. Small fissures may develop in which at times there is slight hemorrhage. A deficiency of this vitamin also causes liver damage and degenerative changes in the spinal cord. This may be responsible for the slightly abnormal gait shown by chicks suffering from dermatosis. In adult fowls pantothenic acid

deficiency does not result in dermatosis, but is manifested by poor hatchability and high embryonic mortality.

Although a dermatosis has been observed in commercial flocks of chicks which is indistinguishable in many respects from that resulting from pantothenic acid deficiency, it has not been possible up to the present time to show that it is of nutritional origin. When chicks are fed a ration containing a considerable quantity of dried raw egg white, they develop a dermatosis which is also indistinguishable from that resulting from pantothenic acid deficiency. Recently it has been reported that chicks fed a special simplified ration containing a large amount of pantothenic acid develop a severe dermatosis similar to that observed in pantothenic acid deficiency. In view of these results, field dermatosis should not be diagnosed for the time being as pantothenic acid deficiency.

Nutritional Deficiency Diseases Caused By A Lack Of Minerals

The nutritional deficiency disease resulting from a deficiency of manganese is usually called perosis, but when the disease first became a field problem it was called slipped tendon or hock disease by most people. Perosis is not an uncomplicated nutritional deficiency disease, but is similar to rickets or pellagra in that several essential nutritive substances are required to prevent its development. It has recently been found that an organic factor which has been reported by one investigator to be choline is necessary for the prevention of perosis as well as manganese.

Perosis is a malformation of the bones of chicks. The symptoms usually observed are swelling and flattening of the hock joint with slipping of the Achilles tendon from its condyles. The tibia and the tarso-metatarsus are bent near the hock joint and rotated laterally. One or both legs may be affected. A deficiency of manganese also causes a shortening and thickening of the long bones of the legs and wings. The severity of perosis is aggravated by the presence of large amounts of calcium and phosphorus in the ration. In mature fowls manganese is also essential for the maintenance of egg production, egg-shell strength and hatchability.

Goiter in chickens in iodine-deficient areas has been reported, but it was not produced experimentally until about two years ago. In extreme cases of experimental goiter thyroid glands have been observed which were approximately 20 times normal weight. Histologic examinations of the enlarged thyroid glands show an absence of colloid and a hyperplasia of the living cells of the follicles. These changes were apparent at 6 weeks and increased in severity with age.

The Nutritional Deficiency Diseases Of Practical Importance

Of the nutritional deficiency diseases just discussed, only vitamin A deficiency, vitamin D deficiency, vitamin G deficiency and manganese deficiency appear to be of any great practical importance. Except in the case of these deficiency diseases it is ordinarily unnecessary to resort to the use of special vitamin carriers in order to make poultry rations nutritionally adequate. Vitamin B, vitamin B₆, pantothenic acid and vitamin K appear to be more than adequately taken care of by the cheaper, more common feedstuffs, and vitamin E by making sure that these feedstuffs are as fresh as can be obtained. Although it is not always possible at present to prevent completely the development of gizzard erosions, the use of liberal quantities of wheat-by-products, ground oats and alfalfa meal will give a ration that will be reasonably protective.

The nutritional deficiencies of practical importance must be taken care of by resorting to special feedstuffs which are in general somewhat high-priced. This has resulted in the determination of the quantitative requirement for vitamin A, vitamin D, vitamin G and manganese and of the amount of these nutritive essentials in poultry feedstuffs. As a consequence, high carotene alfalfa meal has been developed within the past few years which together with fish oil has made it possible to satisfy the need of chickens for this vitamin in a satisfactory manner. The same is true for vitamin D, which is supplied in general by biologically assayed fish oil, and for vitamin G, which is supplied in large part by milk by-products, alfalfa meal, dried yeast, liver meal and by-products of the fermentation and distilling industries. The vitamin content of these products can be readily determined either by chemical or microbiologic procedures. The manganese requirement is usually satisfied by the inclusion of small amounts of technical manganese sulfate in the ration at a cost which need not be greater than 2 cents per ton.

Nutritional Deficiency Without Characteristic Symptoms

Not all nutritional deficiency in chickens is made evident by the development of characteristic symptoms. Such nonspecific symptoms as retarded growth, uneven development and rough feathering in chicks and lowered egg production, hatchability failure and loss of weight in hens, in spite of the absence of any well-defined pathology, are often evidence of the presence of inadequate nutrition.

It is desirable, therefore, for veterinarians who attempt to diagnose ailments in poultry flocks and give service to poultry men to possess a considerable knowledge of fundamental poultry nutrition, as well as knowledge and experience in the field of poultry disease. This should include

not only a knowledge of the quantitative requirements for essential nutritive substances, where this information is available, but also a knowledge of the compounding of good poultry rations and correct feeding management. Otherwise it is impossible to determine from the character of the ration and of the feeding management what recommendations should be made to overcome nutritional difficulties resulting in the development of nonspecific symptoms.

It is easy enough to diagnose the nutritional deficiency diseases of poultry because they have characteristic symptoms. It is a much harder task to diagnose accurately difficulties in poultry flocks for which no characteristic symptoms either of a nutritional or infectious nature can be found. It requires the careful correlation of all the information which can be obtained concerning the composition of the ration, the feeding management and the nonspecific symptoms of nutritional deficiency found present. Veterinarians who obtain training and experience in poultry nutrition in addition to their training and experience in poultry diseases can provide a type of service which poultrymen greatly need and for which, in the opinion of the author they will be glad to make adequate return.

COLD BROODING

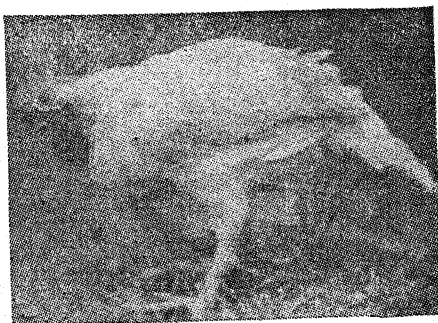
Chicks should not be provided with artificial heat after they are 3 weeks old. To guard against too much of a shock when the chicks are deprived of heat entirely, heat is withdrawn a night or two before they are transferred to cold brooding from the colony brooder. Portable brooder boxes holding 80 chicks are used and the best results are obtained by placing the boxes on fresh ground every few days and providing runs of 6' x 12'. As fresh ground is invigorating, shifting the position of the boxes accomplishes that end.

Fatal crowding is prevented by using wire-netted floors of the fine mesh two inches above the wooden floor of the brooder box. The ventilation beneath prevents the suffocations which occur when chicks crowd down on solid floors. The settling of moisture on the inside of the box and on the bodies of the chicks calls for additional ventilation.

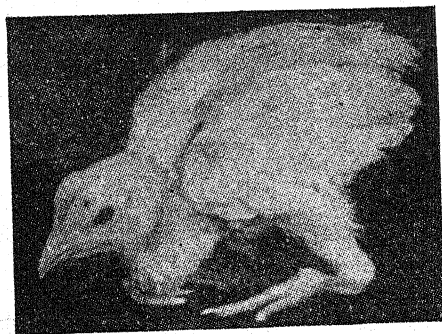
The standard brooder box is divided into two sections, one for sleeping quarters and the other for a small scratching pen needed when the weather or cold mornings prevent turning the chick into the run. The scratching section is equipped for feeding and drinking. This method of brooding chicks is definitely recommended and practiced at the Parafield Poultry Experiment Station. [*Excerpt from an article entitled "Hot Brooding, Cold Brooding, Feeding and Ailment of Chickens" by M. W. Aird, Poultry Adviser, Parafield Poultry Experimental Station. The Journal of the Department of Agriculture of South Australia, xlv. (Sept., 1940), pp. 71-74.*]



White Leghorn cockerel suffering from vitamin A deficiency.



White Leghorn cockerel afflicted with rickets.



White Leghorn chick showing the preliminary phase of riboflavin deficiency.



White Leghorn chick showing the dermatosis resulting from pantothenic acid deficiency.



Rhode Island Red pullet afflicted with the slipped-tendon phase of perosis.



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Deputy Director, H. E. H. The Nizam's
Civil Veterinary Department,
who retired from service in June 1941.



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Editorial

VETERINARY PUBLIC HEALTH IN MUNICIPALITIES

III

MEAT INSPECTION

Attention of the authorities in this country has been, from time to time, invited in these columns to the present deplorably scandalous method of meat inspection. A competent observer has put it down that "meat inspection in this country is a laughing stock and a national disgrace. It is most imperfect, shamefully unsatisfactory and unscientific except perhaps in a few big cities". He further adds "the country is studded with unlicensed, unhygienic, ill-kept and badly managed slaughter houses practically under nobody's control and with no facility for a proper examination". We have also, many times, placed before the public and the authorities the supreme importance of meat inspection by fully qualified Veterinary Surgeons in the best interest of National Health. But it is distressing to note that no attention has been so far paid to this important subject in any of the provinces and states. Even the popular Congress Medico-Ministers who held charge of Public Health Departments in their portfolio, failed to pay heed to what we have said in this behalf. When the otherwise comprehensive Public Health Bill was on the anvil of the Madras Legislature, sponsored by the Congress Medico-Minister, we pressed this matter along with some other important items, on the attention of the Minister and other authorities. It is indeed very regrettable

that the bill became an act without undergoing any change to utilise the services of a Veterinarian in the public health organisation of the province and the old order continues even to this day. According to this order of the Government, the local bodies—Municipal or Panchayat, are empowered, at their option, to utilise the services of local veterinary surgeons for meat inspection, paying them an allowance up to a maximum of Rs. 15 P. M. for this service and also a conveyance allowance if necessary. In practice, the amount paid at present varies from Rs. 5 to Rs. 15. Principles do not count in fixing up these allowances but it is only the personalities. Even the question of utilising or not utilising the services of a veterinary surgeon for meat inspection does not always depend on principles of either economy or health but it is in most cases a question of personal equation, depending upon the whims and fancies of the Chairmen and/or the Chief Executive Officers. We often read in the Annual Administrative Reports of the Veterinary Departments in the Provinces, especially in Madras, that "several Municipalities and Panchayat Boards continued to utilise the services of the local Veterinary Surgeons for meat inspection work during the year. In a few cases, (sometimes places are mentioned) the Municipalities and Panchayats ceased to utilise the services during the year under report. The following Municipalities and Panchayats, (names given) have utilised for the first time the services of the local Veterinary Surgeons for meat inspection purpose." No reasons are given for either utilising or not utilising or not continuing to utilise the services of local Veterinarian for this work. Want of funds can never, at any rate, be the cause for not continuing or for not engaging. For many Municipalities derive huge income from the levy of fees on each animal slaughtered and also from licences and rents in connection with the meat trade. The income from this trade even in a Panchayat area is sufficient to cover up all the incidental charges including the fees for the services of the Veterinary Surgeons. Since it is not compulsory under the Public Health Act to utilise the services of the Veterinary Surgeon for anti-mortem and post-mortem examination of

animals intended for meat for human consumption, the local bodies view the option as opportunities for distributing patronage.

The slaughter houses and meat markets are again in very unsatisfactory and insanitary conditions. Their location in most cases is in the outskirts of the towns close to insanitary areas. We do not propose to deal here in detail with the several objectionable features of meat trade as it exists to-day in this country. It is not uncommon to read in the Health Officers' Annual Reports "a distressingly high mortality from diarrhoea and dysentery and like diseases" traceable mostly to bad or contaminated meat.

The supreme necessity of meat inspection by a qualified Veterinary Surgeon has been well recognised in the highly civilized countries of America and Europe where the method of a scientific meat inspection has reached a very high standard and there is no town in those countries without a well-equipped abattoir. They have also well realised that a fully qualified Veterinary Surgeon is the man fit to control, manage and supervise the meat trade. The Departmental Committee on meat inspection in England and other well known authorities have also recommended that actual work of meat inspection should be carried out by Veterinarians. No public health organisations can be complete without a Veterinarian in it, has been well understood and acted upon in those countries. Whatever may have been the causes for not having realised this fact in this country in pre-British days, there is absolutely no reason for continuing the present deplorably scandalous state of meat inspection even in these modern days when the problem of public health has been receiving highest attention in every civilised country in the interest of national health and national wealth.

It is therefore highly necessary that all food animals should be examined both before and after slaughter *i.e.* anti-mortem and post-mortem by a fully qualified Veterinary Surgeon. Abattoirs of standard and scientific design should be

constructed in healthy localities. Unlicensed and private slaughter houses and meat markets should be abolished. Suitable bye-laws for their working and management should be introduced and *enforced*. It must be made compulsory on all the Municipalities and Panchayats to utilise the services of the local Veterinary Surgeons as meat inspectors and to place the meat trade under their management. An efficient and well managed abattoir and meat trade will safeguard public health in addition to its being a source of income to the local bodies. It is earnestly hoped that at least in the provinces where British I. C. S. Officers are advisers to the Governors, this urgent reform in this important matter of meat inspection will be introduced soon, so that other provinces and Indian states may follow this healthy example.

PINJARAPOLES AND GOSHALAS

Peculiarly unique in nature and conception are certain institutions in our country. Pinjarapoles and Goshalas are two such institutions. Pinjarapoles are places founded on the principle of Ahimsa wherein old and sick animals which are no longer fit for use are housed, fed and looked after carefully until they die a really natural death. In other words, they are Refugee homes for the dumb suffering animals. Goshalas are institutions which maintain and tend cows and bulls out of a feeling of innate reverence for the cow. They are run by pious persons to whom Go-sevak or service to the cow is a religion. Thus both the institutions have sprung out of humanitarian considerations and concern for the dumb animals. In some places, the institutions are combined into one instead of being kept separately. Both of them are maintained out of private funds and endowments.

These Pinjarapoles and Goshalas rose from small beginnings years ago; but now they have gradually expanded in size and also in scope of work. The number of animals in some of these places go into hundreds. They take in not

only animals which are not economical to maintain but also useful animals rescued from the slaughter houses. As a result, a good number of them have become unwieldy and unmanageable; and like many a benevolent and humanitarian institution, these also have fallen on evil days. They are badly managed and it is sorry to record that the dumb animals are not as well looked after as they are expected to or as well as one would like it. The mismanagement has in some cases gone to such an extent that, as one great personage puts it, these Pinjarapoles and Goshalas are more a salve to our conscience than a protection to the cow. Still, there is no doubt that, if the basic fundamentals of these institutions are borne in mind and they are run on correct lines, they can be made to contribute a good deal to the improvement of the livestock of the country and go a long way in solving the milk problem of big towns and cities. Here then is an opportunity which the Veterinary organizations should seize and work up in the interest of the livestock and dairy industry of the country.

Almost the very first thing that should be done is to arrange for the removal of these institutions from the midst of crowded localities and put them up in places where the animals will have ample room and scope for grazing and exercise. This, one need hardly say, will be in the best interests of the health of the animals. Plenty of open air, and good fodder are essential things for their welfare and these are difficult to obtain in the midst of towns and cities. Having located them in good surroundings, it is highly necessary that the organisation is thoroughly overhauled and the management put under expert supervision and guidance. At least one Veterinary Surgeon ought to be on the management to guide the administration in the matter of feeding and general upbringing of the animals. They must be classified and put in under different categories, special care being taken to put useful cows separately. Stud bulls of the approved type and suited to the requirements should be obtained and used for breeding purposes. Protection of the inmates from contagious diseases, castration of undesirable bulls and distribution of promising males to approved persons

interested in animal breeding may also be usefully undertaken. Arrangements should be made for the proper disposal of urine and dung in the premises. And lastly, steps must be taken to utilise the carcasses of animals dying of natural causes. The skins can be tanned, bones may be crushed and used as bone meal, horns and hoofs for the manufacture and preparation of combs, fancy articles, glue and so on. In these and similar ways, these Pinjarapoles and Goshalas can be reformed and improved.

Of course, we readily admit that reform of any institution, especially of those formed on a religious bias is not an easy thing. But one need not despair on that account and leave things to drift away. A start must be made at some time or other. And now that the Veterinary Departments have got the management of the livestock also, they should assume responsibility in this matter and take up a definite step in improving the existing state of affairs.

RETIREMENTS

M. SUNDARANATHAN, G.M.V.C.

The retirement of Sri M. Sundaranathan, G.M.V.C., Lecturer in Pharmacology, Madras Veterinary College, after more than 32 years' of Government service leaves a definite landmark in the history of that College.

Born in the year 1887 in Pattukottai of Tanjore District, he had his early education in the St. Joseph's, Trichinopoly. He was very nearly sent up to study for priesthood but the good luck of the Veterinary profession prevented it. He was one of the earliest batch of students that joined the then newly opened Madras Veterinary College and passed out of that institution in 1909 with distinction. He was the recipient of the Gold Medal for the best student in the College. Not only in studies but also in the field of sports he was carrying away the first prizes. After taking the Diploma of the College he

joined the Civil Veterinary Department and worked in different places for short periods. He was then posted to the Hill station, Coonoor, where he stayed for a fairly long time. His merits and abilities soon attracted the attention of the authorities who drafted him to the College in the year 1920 where he remained until his retirement.

Possessed of sound commonsense, plenty of initiative and fearless outlook he commanded the respect and regard of all. His abilities as a clinician and surgeon were acknowledged all round and his services were greatly in demand. And when it is realised that he is a product of the Madras Veterinary College, unadorned by foreign travel, Post-graduate studies and Refresher courses, his professional skill must be a source of pride to his professional colleagues and brethren. During his period of over two decades' stay in the college, he has contributed not a little to the building up of the high standard of the Madras Veterinary College.

We wish Sundaranathan many years of healthy and happy retired life.

N. D. DASAN, G.B.V.C.

Mr. N. D. Dasan, Deputy Director, Veterinary Department, Hyderabad-Deccan, who retired from service in June 1941 was born on the 22nd of June 1886 at Kolar of Mysore State.

After his early education, he entered the Bombay Veterinary College as Mysore State Scholar and graduated out of that College in the year 1911. Immediately after graduation, he accepted a post of Veterinary Officer at Port Blair, Andamans where he stayed only for a short time. From 1912 to 1915 he practiced at Rangoon. In 1915, he was appointed as a Veterinary Inspector in H. E. H. the Nizam's Civil Veterinary Department. While in service there, he underwent a Post-Graduate training at Mukteswar, and practical field training in S. S. Inoculation and other research work in Mysore State. He took active interest in popularising the S. S. Inoculation which

was then new to the country and conducted many a camp successfully. In 1931, he was promoted as Deputy Superintendent at Aurangabad wherefrom he retired.

Mr. Dasan is the author of the well known book "Notes on Bazaar and Indigenous Drugs, Useful in the Treatment of Animals" which was published in 1929 and which was very well received by the profession and the public.

A very conscientious and zealous officer, Mr. Dasan has been a popular and successful practitioner. Wherever he was posted, he endeared himself to one and all by his lively interest in his work. He is keenly interested in rural work and specially in improvement of livestock and we hope he will have ample opportunities to work in that direction now that he is relieved of official routine work.

We wish him a long period of useful life in his retirement.

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Clinical Articles

A CASE OF NEURO-FIBROMA IN A BULLOCK

BY

M. RAMAKRISHNA PILLAI, G.M.V.C.,
Veterinary Assistant Surgeon, Madanapalle.

Subject :—Local-bred bullock, aged about five years, (case No. 908) admitted on 16-6-41.

History :—The animal had a fall four months previously with its face downwards and had some bleeding through the left nostril; after four or five days, the bleeding stopped. About fifteen days later, the animal went on rubbing the face against any hard object evidently due to some irritation there. Gradually snoring was noticed which subsequently developed into laboured breathing. On the date of admission it was breathing with much difficulty.

Symptoms and Diagnosis :—On examination, the following symptoms were noticed: Sero-sanguineous discharge from the left nostril: slightly swollen condition of the left side of the face with a small circumscribed swelling on the left side just at the place indicated for the trephining of the frontal sinus. It pitted on pressure and on percussion a dull sound was elicited. Pus in the frontal sinus was suspected.

Treatment :—16-6-41 to 20-6-41: The affected nostril was irrigated with alum lotion, the fore-head was fomented and Turpentine liniment was rubbed and the progress was watched. No improvement was noticed and as the condition of the animal was getting worse, trephining of the frontal sinus was decided upon.

On 21-6-41, the frontalsinus was trephined on the left side at the place where the circumscribed swelling was found and the sinus exposed. A small quantity of sero-sanguineous discharge came out. On examination with the finger, the whole cavity was found to be filled with organised blood clot, inflammatory tissue and pieces of necrosed bone. When an attempt was made to clean the whole cavity there was profuse bleeding. And, therefore, only a portion of it was removed. The sinus was irrigated with a weak lotion of Hydrargyri Perchloride and plugged with medicated tow. When released, the animal appeared to breathe a little more freely. Next day some more of the contents of the sinus were removed, the sinus irrigated and the opening closed with a plug of tow. Blood was trickling down the nostril after the operation. At about 2 P. M., the animal became very bad with dyspnoea and died within a few minutes.

Post-mortem Examination :—When the skull was sawed through longitudinally, two growths were found in the nasal chamber, one on either side of the posterior meatus, just occluding the passage. The left one was about the size of a small lemon while the right one was of the size of a marble. There were no other abnormalities except a slight congestion of lungs.

The growths on histo-pathological examination by the Principal, Madras Veterinary College, were declared to be Neuro.Fibroma.

Discussion :—Gaiger and Davies (1931) observe that while true neuroma is rare in domestic animals, false neuroma or neuro-fibroma has been recorded in horses, cattle and pigs and they describe it as consisting of connective tissue overgrowths related to nerve sheaths. Under etiology, they have put down "irritation" as one of the causes.

In the present case, the accidental fall the animal had about four months previously was, in all probability, the "irritation" which started the Neuro-Fibroma.

CALCIUM DEFICIENCY IN A PUP

BY

C. V. PADMANABHAN, G.M.V.C.,
Veterinary Assistant Surgeon, Polavaram.

A Bangalore bull pup, aged about three weeks, was brought to me with the following symptoms :

Symptoms :—Unable to raise its head, gait unsteady ; head very much lowered while walking ; complete loss of sight and shivering. Examination of the faeces showed a heavy infection of hook worms.

Diagnosis :—Calcium deficiency and worms.

Treatment :—The pup was first treated for worms. Then calcium (Sandoz) 5 grains was given thrice daily in milk. In a week's time, the pup was able to raise its head but was still blind. The Calcium was pushed on and in another week, it gained its sight but the shivering still persisted. The medicine was repeated for another two weeks, when it was able to walk steadily, run briskly and play with its owner. The Calcium Sandoz, was continued for another month more. The pup got completely cured.

In my experience, the lowering of the head with shivering is generally seen in pups infested heavily with *Ascaris* worms and hence the faeces was examined to start with.

TREATMENT OF FOLLICULAR MANGE BY SODIUM HYPOSULPHITE AND HYDROCHLORIC ACID

BY

C. N. SUBBARAMAN, G.M.V.C.,

Veterinary Assistant Surgeon, Rajahmundry.

Subject :—Pup, about six months old, was admitted on 2-10-41 at the Veterinary Hospital, Rajahmundry, for skin disease of two months' duration.

History :—On examination, the skin was found to be scaly. The colour of the skin was reddish and hairs were falling off. There were small pustules over the head.

Microscopical examination of the scrapings from the skin revealed *Demodex folliculorum*.

Treatment : 2-10-41 : An application of 60 per cent Sodium Hyposulphite solution was made over the affected region by means of a brush. In about 15 minutes, the part became whitish in colour ; a 5 per cent. solution of Hydrochloric acid was applied over it. This was repeated on 5-10-41 and 13-10-41. Skin scrapings were examined from the animal on 6-11-41 when no *Demodex folliculorum* were detected.

Two other dogs were treated in a similar way, while I was in Coimbatore District in 1940, and the results were satisfactory.

I will be thankful to the readers of this *journal* for their experiences with the above applications.

A CASE OF URETHRAL CALCULUS IN A BULL

BY

M. RAMAKRISHNA PILLAI, G.M.V.C.,

Veterinary Assistant Surgeon, Madanapalle.

Subject :—Brown, cross-bred Hallikar bull (Case No. 1299), aged four years, admitted on 19-7-41.

History :—The animal has been straining hard during micturition for the previous one week and the urine was being passed only in drops. On examination, the animal had an anxious expression and the visible mucous membranes were injected. It was off its feed. Further examination revealed

the presence of an urethral calculus at the first bend of the sigmoid curve of the penis.

Operation :--The animal was given a dose of Chloral Hydras orally and the urethra was opened at the seat of obstruction. The mucous membrane appeared to be very much thickened and inflamed and three stones, one of the size of a Jambul seed and two smaller ones, were removed. Contrary to expectations, there was no flow of urine even after the removal of the stones. It was coming only in drops. From the site of operation, an attempt was made to pass a rubber catheter into the bladder but it was not successful. It was therefore decided to make a second opening.

On 21-7-41 the second opening was made at the perineal region about 5" from the anus and the urethra was exposed. On opening it, dark cloudy urine rushed out with a strong ammoniacal odour. About a pint of urine was removed. A small rubber catheter was introduced through the urethra into the bladder and it was irrigated with warm sterile normal saline. The catheter was left in the urethra and the animal was allowed to get up. After the removal of the urine the animal appeared much relieved and it took its usual feed and water from the next day. After-treatment consisted in the dressing of the two operated wounds for about 3 weeks with Acriflavin lotion and the application of Bipp dressing.

Of the two openings, the one at the sigmoid curve was closed and the other at the perineal region was kept permanently patent for the passage of urine.

During treatment the animal was given diuretics and urinary disinfectants like Hyocyamus and Hexamine.

From 24-7-41 the animal was put on digestives and tonics and was discharged on 10-8-41. When it was seen again by me in company with the Veterinary Investigation Officer, Madras, on 24-9-41, it was found urinating through the perineal opening. It had also improved in condition.

ACROBUSTITIS—BALANITIS—BALANO-POSTHITIS IN BOVINES

BY

M. ABDUL HAFFIZ SAHIB, G.M.V.C.,
Veterinary Assistant Surgeon, Guntur.

Acroburstitis or inflammation of the prepuce and Balanitis or inflammation of the surface of the free portion of the penis may occur independently, but usually they are associated, constituting what is called Balano-posthitis.

Cases of this nature are being admitted to this institution for treatment in different stages of the disease and I give below a short description of the disease as it occurs in these parts.

The condition is chiefly met with among bovines of the Ongole type. The cause may be due to some foreign matter such as small grass blades or sand gaining entrance into the sheath or an injury, due to direct violence, followed by infection of the injured part. Lying in dirty wet areas, improper cleaning and neglect are also other causes responsible for this condition.

Symptoms :—These may conveniently be divided into three stages. First stage : To start with, there will be marked inflammation of the preputial opening followed by oedema. Small abscesses, one or more, about the size of a marble are seen along the sheath. They are tense, hard and deeply situated.

Second stage :—Neglect and want of care on the part of the owner brings further complications. In this stage, the preputial opening gets constricted gradually and the urine is passed in droplets, ultimately resulting in retention of urine and infiltration into the surrounding tissues. In all cases "Phimosis" occurs.

Third stage :—Infiltration into the tissue surrounding the prepuce becomes more prominent and this is followed by the sloughing of the part with, in some cases, of the penis also. The oedema becomes more marked and extends up to the scrotum, in severe cases, right in front up to the sternum and on either side of the flanks below the abdomen. Systemic disturbance is observed invariably in this stage. The animal is unable to move and is in great distress with a foetid smell about it. The condition, if neglected, ends in the death of the animal.

Treatment is mostly symptomatic. I describe in brief the treatment that I have been adopting.

First stage :—If only inflammation or oedema, clean the part well, clip the hair at the entrance to the prepuce and syringe the sheath with warm boric lotion, and remove all the foreign material, dirt etc. Dress the lining membrane with boric ointment and rub iodine ointment on the oedematous part. Acetic acid and chalk paste has been found to give good relief. The small abscesses are treated surgically. Smears from pus were examined by the Principal, Madras Veterinary College and no specific organisms were found.

Second stage :—If the preputial opening shows a tendency to close up, care is taken to see that it is enlarged. If necessary, scarification with a curette may be done externally on the sheath including the prepuce.

Third stage :—If the preputial opening is closed up, a “V” shaped piece of the sheath at the level of the point of the penis is excised and the urine allowed to have a free passage. Deep scarification is made on either side of the sheath and the unfiltered urine is allowed to drain off. If sloughing of the penis occurs it may be amputated and attended to. Recovery may take place even after a portion of the penis sloughs off.

In two of the cases so treated by amputation, the condition recurred after about 6 months due to the closure of the preputial opening. This resulted in retention of urine and infiltration.

NIGHT BLINDNESS IN A BULLOCK

BY

SYED ABDUL KHADER SAHIB, G.M.V.C.,
Veterinary Assistant Surgeon, Kaikalur, Madras.

History :—A bullock (case No. 161), in a debilitated condition was brought to the institution on 30th May 1941 with the history that for the past 2 months the animal, after sunset, was not in a position to see its way and was knocking itself against objects. On examination, the animal was found to be rather anaemic but no serious abnormalities were detected. Both eyes were apparently normal. Blood smears and sample of dung were sent to the Principal, Madras Veterinary College, who reported as follows :—“Blood smear—*Microfilaria* present; Dung :—No ova or parasites could be detected”.

Treatment :—The treatment was expectant till the receipt of results of the specimens sent. On receipt of the results, on 7-6-41, 8 gr. of Antimonii et Potassii Tartrate in 20 c.c. of aqua distillata was injected intravenously and the same was repeated on 12-6-41 and 16-6-41. During the intervening days half an ounce of Liqr. Arsenicalis was given in a pint of water every day.

From 16-6-41 onwards the animal was put on a course of tonic powder and common salt and discharged.

Subsequently on 28-8-41 the animal was brought to the institution when the owner said that the normal sight of the animal had been restored and that after the treatment the animal was able to see things clearly during nights. This aroused my interest in the animal and knowing that I treated it only for *microfilaria* I wanted to make sure that the blood of the animal was free from this parasite. The blood smears were sent to the Principal, Madras Veterinary College, who reported that no *microfilaria* or any other organisms could be detected.

Conclusions :—The following points deserve consideration :—

- (1) Whether the microfilaria caused debility in the animal;
- (2) Whether the presence of microfilaria in the blood, had anything to do with night blindness which is usually common in stall-fed animals, without an allowance of green grass in the ration.

The points raised in this article require further observations before definite conclusions are drawn.

OL. MURRHUÆ IN CORNEAL OPACITY

BY

RANVEER SINGH,

Veterinary Assistant Surgeon, Jodhpur.

Subject :—A brown I. B. Entire, in good condition, aged about 9 years, used for tonga.

History :—The owner of the horse had dismissed his coachman, who, in a fit of spite, was said to have applied over the eyes, a paste of sweet oil and powdered lizard prepared by burning the lizard found in houses. Next morning the animal was found to be totally blind. It was therefore brought to the hospital on 6-4-41 and admitted as an in-patient.

On examination, it was found that both the eyes had developed complete corneal opacity and acute conjunctivitis. There was profuse discharge from both the eyes and the animal was in great distress. The temperature however was normal.

Treatment :—The paste was thoroughly washed off with clean water and then the eyes were irrigated with Z. A. B. lotion (containing Zinc Sulph 1 part, Alum 1 part and Boric Acid 2 parts). Boro Calomel was dusted on both the eyes. It was put on a low diet.

This Z. A. B. lotion and Boro Calomel was continued for about two weeks but there was not the slightest improvement in the condition. The treatment was, therefore, changed to application of yellow ointment (Plasma ointment) after irrigating with Z.A.B. lotion. This treatment also was continued for about a fortnight, but the results were disappointing. Then the following treatment was adopted: The eyes were washed with clean water and about 10 drops of Oleum Murrhuae (Cod-liver-oil) were put into each eye: the hairs were clipped off from the temporal fossa and unguentum Hydrargyri Iodidi Rubrum 1 in 12 was rubbed in. Internally a dose of physic was given.

This treatment of cleaning the eyes and putting in the cod-liver-oil was carried on twice daily for about 8 days when distinct improvement was noticed. The opacity was only 20 per cent. of what it was and the animal was showing signs of returning to vision. It could be taken out for exercise without any difficulty.

The treatment with Cod Liver Oil was therefore continued for another week. Both the eyes became normal with complete vision and the animal was discharged cured on 3.6.41. Since then the animal is working all right in tonga and is in good health.

OBSERVATIONS ON THE TREATMENT OF LUXATION OF PATELLA IN BOVINES WITH INJECTION OF TINCTURE IODINE

BY

B. RAMIAH, G.M.V.C.,

Veterinary Assistant Surgeon, Bobbili.

Twenty two cases of Luxation of Patella were kept as in-patients at Hindupur Hospital during the year 1939-40. All the cases which were brought were working cattle. Tincture Iodine was injected either very near the patella in the depression external and immediately behind it or into its capsule. The dose used ranged from 7 to 10 c.c. the latter dose being used for large sized animals.

Of the 22 cases recorded, 8 cases discontinued on the second or the third day, 8 cases were discharged between the 4th and the 7th day, and 6 cases were discharged between the 7th and the 18th day after injection.

The first 8 cases which discontinued on the next day naturally received only one injection. Of the 8 cases discharged between the 4th and the 7th day, 3 cases required two injections and the remaining received only one as the luxation did not recur. In those cases in which it recurred, it did so between the 2nd and the 4th day generally.

Of the 6 cases which were discharged between the 7th and 18th days, two cases were affected in both hind legs. In one case the left hind received only one injection and the right required three, and in the other the left hind required two and the right, three injections. The remaining 4 were affected only in one limb; two of them received three injections while the others, two injections. These six cases were really bad cases and the second and third injections were given when the luxation reappeared

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after each injection which was usually within two to four days. By the time the cases were discharged, only a slight improvement was noticed in four cases and no improvement at all in two cases.

Results

There are many difficulties in the way of correctly estimating the results in animals. The indifference of the ryots to communicate the results to the Doctor and their inability to detain the animals in the hospital until a cure is effected are the chief causes. The frequent change of ownership of affected animals is also a contributory cause. Still, whenever possible, opportunities were availed of to verify at least some of the results. Of the ten cases which either discontinued or were discharged within a week, the results were verified in 5 cases after an interval of 2 to 6 months from the time of the injection and they were found doing well.

The 6 cases which were kept as in-patients from one to two weeks were bad cases and required two, three or more injections. In these cases the animals were either very badly dragging the hind limb on the ground or nearly hopping on three legs with the affected limb kept extended till they could get the bone in position. Of these cases, there was a slight improvement in three and no improvement in others at the time they left the institution.

Untoward Results

Occasionally it happens that the lameness due to the inflammatory reaction of the injection persists for a long time. The animal becomes dead lame, loses condition and causes much anxiety to both the owner and the practitioner. I had one such case and it took four to six weeks before something beneficial could be done. If there is no opportunity of attending to such a case it is really a great loss to the ryot as the animal would be useless for further work. If an animal has luxation in both the hind legs, one leg after the other should be taken for injection. Both should never be taken at the same time.

Summary and Opinion

1. The complaint is observed in working cattle, cows and she buffaloes; but only working cattle are brought for treatment. I have not observed it in young animals under two years.

2. The medicine may be injected either near to the patella or into the synovial capsule enclosing it. Cures have been observed in either case.

3. Mild cases require ordinarily one injection and they get cured. In some cases, however, the luxation reappears between the second and the fourth day after the injection when the animal is re-injected. If after

injection the luxation does not recur within five days, cure can be expected. Bad cases require three or more injections and in such cases only improvement was noticed. In very bad cases the cure is questionable.

4. Recurrence of the luxation after once cured does occur. It is not a permanent cure. A case had come to my notice, in which the injection was followed by a cure which lasted for two years after which the luxation recurred, and the owner got the animal injected once again.

INSECT BITE (?) AND ITS TREATMENT.

BY

SYED ABDUL KHADER SAHIB, G.M.V.C.,

Veterinary Assistant Surgeon, Kaikalur, Madras.

History :—A bull (Case No. 343) aged about nine years, was brought to the institution with a swollen dewlap and with no other clinical symptoms. The duration of the illness as given by the owner of the animal was of only two days. The onset of the disease was stated to be sudden.

Examination :—The condition of the animal was found to be normal except for the swelling of the dewlap. The swelling was about five inches in thickness extending from the angle of the jaw to the brisket. It was hard, hot and painful to the touch. The bullock was in a poor condition. The heart was examined and it was normal.

Treatment :—In my experience so far, I have come across a good number of similar cases. The treatment adopted in these cases may be said to be rather symptomatic, extending to a number of days and was found to be unsatisfactory. In as much as no history of a traumatic nature is given, the cause of inflammation was suspected to be due to the bite of an unknown insect. Biting insects in general, inject into the body of their victims an acid material which is similar in composition to Formic acid. To neutralise the acidity of such a material was indicated. Arguing thus, I injected on 13-8-41, 10 c.c. of a 2% solution of Sodium Bicarbonate into the middle of the swelling with all aseptic precautions.

The next morning the swelling practically disappeared. A slight thickness was present close to the brisket, which gradually disappeared in the next few days.

A CASE OF ASCITES IN A BULLOCK

BY

M. RAMAKRISHNA PILLAI, G.M.V.C.,

Veterinary Assistant Surgeon, Madanapalle.

Subject :— Local-bred grey bullock, case No. 1695, aged about six years, admitted on 23-8-41 with the history that it had not passed urine for the previous 4 or 5 days. The owner had tried some of the indigenous medicines, but as there was no relief, he brought the animal to the hospital for treatment.

Symptoms :— General appearance dull: disinclination to eat or drink, abdomen slightly bloated: percussion revealed the presence of ascitic fluid. Examination per rectum revealed a highly distended bladder.

Diagnosis :— Ascites and retention of urine.

Treatment :— The abdomen was tapped at its inferior aspect about 3" to the right of the umbilicus and twenty gallons of straw coloured fluid was removed. Along the fluid came out 5 setaria worms (*Setaria labiata papillosa*,) as identified by the Principal, Madras Veterinary College. After the removal of the fluid, the animal began to urinate freely and began to look much brighter. The same evening it took its usual food and drink.

Internally, salines with diuretics and urinary disinfectants were given for 5 days after which the animal was put on digestives and tonics. The case was discharged cured on 31-8-41.

As the animal came from a village 20 miles away, I did not have an opportunity of seeing it again to know whether there was a recurrence of the trouble or not.

Remarks :— For the past one and a half years, while ascites has been recorded in dogs, this is the first case met with here in bovines. From this it would appear that the condition is comparatively rare in bovines in these parts.

Though 20 gallons of fluid were present, the condition of the abdomen did not indicate its presence at first sight.

The passing of 5 Setaria worms through the canula was interesting; probably there were a fairly large number of such parasites in the peritoneal cavity.

Association News

THE MYSORE VETERINARY MEDICAL ASSOCIATION.

Proceedings of the Twelfth Annual Conference of the Mysore Veterinary Medical Association, Bangalore.

The Twelfth Annual Conference of the Mysore Veterinary Medical Association was held in the Daly Memorial Hall, Bangalore at 4 P. M. on the 17th and 18th of January 1942. The first day's functions began with a tea party and taking of a group photo. Nearly 100 members from different parts of the State attended the Conference which was opened by F. Ware Esq., C.I.E., F.R.C.V.S., I.V.S., Animal Husbandry Commissioner with the Government of India and was presided over by B. K. Badami, Esq., G.B.V.C., Director of Veterinary Services, Hyderabad (Deccan). Among the distinguished visitors may be mentioned Dr. V. V. Montero, Senior Surgeon with the Government of Mysore, Messrs. T. G. Ramaiyar, Director of Agriculture in Mysore, A. K. Yagna Narayana Iyer, Retired Director of Agriculture, Mysore, V. C. Vellingeri Gounder, President, Coimbatore District Board and M. L. C., Rao Bahadur C. Javaraiya, and many Veterinary Surgeons from different parts of India who had come for the first All-India Southern Regional Cattle Show held during the same period in Bangalore, also attended the Conference.

Tea and group photo being over, the Conference met in the tastefully decorated hall. After invocation, Mr. S. D. Achar, President of the Association and Superintendent of Veterinary Services in Mysore, welcoming the delegates and visitors said :—

MR. WARE & GENTLEMEN,

On behalf of the Mysore Veterinary Medical Association, I accord all of you a cordial welcome and thank you for your presence here to-day.

In the first place, I express our most sincere thanks to Mr. Ware for having kindly accepted our invitation to open our 12th Annual Conference. He is the most distinguished member of our profession in India and we congratulate ourselves on having secured him to open this Conference. Col. Sir Arthur Olver opened our 7th conference and this is the second time we are having men who hold the highest position in the Veterinary profession in India do us honour.

I also express our deep gratitude to Mr. B. K. Badami, a distinguished son of the soil and the head of the Veterinary Services in Hyderabad for having kindly consented to deliver the inaugural address.

Mr. T. G. Rama Iyer's presence here to-day in spite of the many and heavy demands on his time, is another proof—if proof were needed—of his keen interest in Veterinary activities and we thank him most heartily for it.

We also extend our welcome to the worthy guests who have shown their interest and good will towards us by their kind presence here this evening.

Conferences of this kind go far to promote feelings of good-will and esprit-de-corps among the members. Contacts with our confreres, free discussions, exchange and comparison of notes are highly beneficial for improving our knowledge and efficiency. Concerted action and organised effort help us to get our wrongs redressed, difficulties overcome and defects remedied. Here, therefore, lies before us our opportunity to get inspiration, encouragement and to gather strength in our work as we have done during our previous Conferences.

So as to avoid exceeding my time limit by going into the details of the achievements of the Departmental activities, I may be permitted to briefly mention a few of the out-standing features of the Veterinary Services in the State during the year that is just past. It is not only a year of considerable progress but also a record year in many respects. Private endowments from philanthropic persons for Veterinary Hospital Buildings in the State amount to a total sum of Rs. 17,500/-. Besides this, the Bangalore Ladies' Club have donated a sum of Rs. 3,000/- for an X-Ray out-fit for the Veterinary Hospital at Bangalore City. This, I take, is an index of the popularity and usefulness of the Department.

It is a record year for the Mysore Serum Institute also in that 10,71,882 doses of all kinds of sera and vaccines were manufactured and issued during the year both within and outside the State.

Gentlemen, we have in Mysore a fully organised Department having Veterinary Institutions in all Taluks and more than one in some in charge of qualified Veterinarians, a Serum Institute for manufacture and supply of biological products, a Veterinary Research on animal diseases, also a Sheep Expert and Poultry Special Officer. In each of the nine Districts we have a District Veterinary and Livestock Officer to direct and co-ordinate all Veterinary and animal husbandry activities.

The number of fresh cases treated in the 81 Veterinary Institutions in the State during the year was 3,88,103 nearly 20% over and above the number of cases treated during the preceding year. A special feature was the opening of five itinerary Veterinary Dispensaries on Shandy days in the important centres of cattle population in the rural areas. Systematic tours were also undertaken by the Veterinary Inspectors and their staff

in the interior villages with a view to extending Veterinary aid to the rural population at their very doors. It is proposed to open 4 additions to a few Hobli Dispensaries. We have now 1 veterinarian for 60,000 cattle. Although this, compares favourably with many other provinces and States, we are still far short of the recommendation of the Royal Agricultural Commission to the effect that we should have at least one Veterinarian for every 25,000 cattle.

During the year, a scheme for the control of Liver Fluke Disease of cattle and sheep in the water-logged areas under Irwin Canal was sanctioned by Government. The work comprising of — spraying infected areas, dosing of affected animals, collection and destruction of snails and employing fish and ducks for the control of the larval forms of the Liver Fluke worm and of the snails is in progress.

Another scheme for the free supply of good stud bulls to the Municipalities which agree to maintain them at their own cost at the local Veterinary Hospital has also been sanctioned. So far, 16 Municipalities have agreed to maintain stud bulls and have already been supplied. Stud bulls have been stationed also in 7 out of 9 District Veterinary Hospitals. Three buffalo breeding bulls have been stationed one in each of the three District Hospitals of Kolar, Chikmagalur and Mysore. Two are at service in each of the Mysore and Dodballapur Hospitals.

Seeing that the ranching system of raising Amrit Mahal Kaval herds, however much suited to produce animals for field conditions, could not adequately serve agricultural needs and purposes, it had to be modified. As a result, two more Cattle Breeding Stations were started this year on farming system.

Among the new schemes under consideration of the Mysore Government are the establishment at least of four more such Cattle Breeding Stations in the different parts of the State and the starting of a Dairy Farm at Bangalore.

A Fodder and Grazing Committee for Mysore met twice and its final report was published and circulated.

The S. P. K. A. Dispensary in Bangalore has been declared an Infirmary under the P. C. A. Act. It has been now recognised as a grant-in-aid Institution and a subvention has been granted to it in view of the useful services it has been rendering to the Northern part of Bangalore and the neighbouring villages.

A Dairy Cattle Breeders' Association has been started for salvage of dry cows, Veterinary Inspection and milk recording of Dairy cows and publi-

cation of a useful monthly bulletin, among other things. I am looking forward to the day when branches of this Society will be opened in all other towns. Private Gorakshanasalas in Bangalore, Municipal Gokulam in Mysore and Pinjarapole are doing excellent work.

Poultry

Two more Poultry Units one at Kolar Veterinary Hospital and the other at Kadur Veterinary Dispensary were opened to meet the growing demands of Poultry breeders for improved type of Poultry, thus bringing the number of Poultry Units in the State to 14.

A drive was made to improve the laying capacity of Desi fowls owned by villagers by introducing pure bred cockerels of white Leg Horn, Rhode Island Red and Black Minorca breeds, especially in the areas surrounding the Rural Welfare Centres of Closepet and Dodballapur; and as many as 1,032 cockerels were distributed to the villagers' flocks.

To supplement the income of the Agriculturists, private people were advised to take up Poultry Farming and the number of such farms is growing. 4,236 chicks were hatched in the Government Poultry Farms as against 3,848 in the previous year. The total valuation of the stock of birds in the Government Poultry Units was Rs. 7,882-8-0 as against Rs. 4,710/- in the previous year.

Classes were held in Poultry Farming in Dodballapur and Hebbal and 50 students were given training in Poultry Farming.

During the year, "Mysore Poultry Association" was also started primarily with the object of stimulating and fostering Poultry Industry in the State and helping the members and ryots to obtain first class stock of Poultry for purposes of breeding and production and for marketing of eggs on a co-operative basis.

A scheme, subsidised by the Imperial Council of Agricultural Research for investigation of Poultry diseases in the State extending for a period of 3 years and costing Rs. 36,300/- in all, has been sanctioned during the year and the work under the scheme is in progress.

Sheep

At the beginning of the year there were 3 Government Sheep Farms and 3 Sheep Breeders' Associations in the State and two more Sheep Farms and two Associations were opened. The total strength of sheep at the Government Sheep Farms was 661 of different breeds. The total number of members of all the Sheep Breeders' Associations in the State, at the end of the year, was 597 with a total strength of 27, 575 sheep under the control of

these Associations as against 389 members with a total strength of 18, 549 sheep in the previous year.

Sorting and grading of wool according to quality, condition and length of staple are being continued on a large scale for the benefit of Sheep Breeders.

A short course in Sheep Farming has also been instituted in the State. The scheme financed by the Imperial Council of Agricultural Research to study the various aspects of — indigenous sheep Breeding, feeding and wool production, etc., was undertaken during the year.

Much of our success in these directions is due to the organised marketing facilities for the products of Sheep and Poultry.

We are meeting here to-day at the time of the All-India Southern Regional Cattle Show held for the first time in Bangalore and we have the unique opportunity of studying the best breeds of cattle in India.

From this naturally rambling report it will be seen that there is much advancement over previous year's work although of course much remains to be done, as will always be the case, and, God willing, it will be done.

Success of any Departmental activities depend on its practicability and economic value and comprehensiveness. The Mysore Veterinary Services are, therefore, not merely confining their attention to treatments of individual illnesses but also to prophylactic measures and to mass manufacture of biologicals. In addition, the Veterinary staff in the State are devoting their attention for raising the standard of animal husbandry in all direction and organising marketing arrangements for products of cattle, sheep and poultry and by increasing their number and improving their quality.

The Agricultural Officers and Officers of the Veterinary Department in our State work in the closest co-operation. By such co-ordinated effort mainly, we have been able to ensure in an increasing measure the enlightenment and the prosperity of the Agricultural population, whose main stay is Animal Husbandry. This is the goal of every well-wisher and is the basis of the prosperity of our State. And for all this progress, no small measure of credit is due to the Director of Agriculture, who has throughout inspired us, guided us and supported us in our work. (I had almost said some-times whipped us into action.)

One word more. We are passing through very critical times. Let us pray and hope that these dreadful days will soon pass and that, before we meet again next year, victory will crown the stupendous efforts of the brave

allies. Let us do our best and give of our best to that end and await the dawn of an era of peace and freedom for all.

I now request you, Sir, to kindly open this, our 12th Annual Conference.

Next, Mr. F. Ware, C.I.E., F.R.C.V.S., I.V.S., Animal Husbandry Commissioner with the Government of India, in declaring the Twelfth Annual Conference of the Mysore Veterinary Medical Association, open, spoke as follows:—

“Mr. Achar and Gentlemen,

“I am very sensible of the honour which the Committee of the Mysore Veterinary Graduates' Association have accorded me in asking me to open this twelfth annual meeting of the Association.

“I am, of course, very delighted to be in South India again, for, as many of you know, I spent the major portion of my service in the south and when I am here I always feel that I have returned to my adopted home.

“Another of my immediate reactions when I return to the south is that there is a very lively professional spirit prevailing amongst the Veterinarians of this part of India, as evidenced by the regularity with which this Conference has been held in recent years and the success which it has attained.

“This success I attribute to the fact that this Conference devotes the major part of its time to the consideration of professional subjects and not to airing grievances. No doubt there are and always will be complaints against the powers that be, but if the Veterinary profession is to take its proper place in the economy of the country, it will not do so by airing complaints, but by each individual making a genuine effort to progress in his science and prove his usefulness to the public. In this connection I should like to quote some words from a speech by the well-known American Veterinarian Prof. Merillat, which were reproduced in a recent number of Indian Farming, which I hope you all read. But in case you do not, here is what he said:—

“‘In preparing our case for trial we must first raise our scientific standards and our professional conduct. We need larger schools and more veterinarians, better skill, a broader knowledge of Zootechnics, and better ethics. It is all a matter of going before the public with sufficient scientific attainment in the one hand and good conduct in the other’.

“Now in Mysore I consider you are very lucky, for, due to the far-sightedness of the higher authorities, who last year brought all the activities connected with health and production in animals under one administrative

head, you are provided with an opportunity of proving your value to the public in a way that is not given to your confreres in several other parts of India. The work of the Civil Veterinary Department in Mysore now includes such important and varied subjects as the production and distribution of stud animals and breeding stock for the cattle, sheep and poultry of the State, their maintenance in health by a network of veterinary hospitals and touring Veterinary Assistants, and their protection against diseases by products manufactured in the State Serum Institute. In this the staff is helped by a small unit specially trained in the investigation of disease.

"Such a comprehensive organisation cannot but be successful in producing results of which we shall all be proud, provided every man pulls his weight, and when these results commence to be apparent then you will benefit in the more material things of life, and such items as the provision of better paid posts for the Veterinary Department will come along.

"But nothing worth having in this world is obtained easily and what I have envisaged will not result without hard work on the part of everyone, and in many cases it will mean taking a post-graduate course in order to fit himself to undertake the new duties that are expected of him.

"I should like to conclude these few remarks by drawing your attention to a book which has recently appeared and is causing a considerable stir in agricultural circles. This is Sir Albert Howard's "Agricultural Testament". To my mind the two most important points brought out in this treatise are the necessity for one directing authority trained in and capable of dealing with all aspects of the particular problem confronting us—in our case the Improvement of Livestock—and the great importance of approaching it from the practical and not the laboratory side. Now that the Civil Veterinary Department in Mysore is responsible for the production of stock as well as its maintenance in health, each one of you has been given an opportunity of seeing the many problems connected with the raising of stock as the cultivator sees them, and I hope you will all benefit from this.

"I am sure you are all waiting to hear what my old friend Mr. Badami has to say to you, and I have therefore much pleasure in declaring this Conference open".

After the Conference was thus declared open, Mr. P. U. Nayar, Honorary Secretary and Superintendent of the Serum Institute, Bangalore, read out messages from members and others unable to attend the Conference. K. V. Anantha Raman, Esq., Revenue Minister in Mysore, Messrs K. S. Nayar, Principal, Veterinary College, Madras and P. Srinivasa Rao, Editor of the Indian Veterinary Journal, Madras, were some of those who thus wired or wrote.

Next item on the programme being the Presidential address, Dr. Badami President of the Conference thanked the Mysore Veterinary Medical Association for their kind invitation to preside at their Annual Conference and expressed his grateful appreciation of the honour done to him.

He referred to relations of the Government of Mysore, its sympathy and support to the Veterinary department in all its activities. They had advanced in veterinary, livestock and research matters. He suggested that for research they must have a section that would deal with the practical testing of indigenous drugs in the treatment of diseases of animals. He observed that it was clear to every body that in a great agricultural country like Mysore where animal husbandry plays a very important part, the Civil Veterinary Department appeared to have won the confidence of the country-side which is proved by the donations received from private donors for furthering the cause of veterinary work. He made a reference to the personality and work of Mr. Ware, the Animal Husbandry Commissioner with the Government of India whom he had the honour of knowing for over 33 years and felt happy that he should have now been associated with him at this Conference. Mr. Ware, he said, had done a great deal in the Madras Presidency to strengthen the Veterinary Department and raise its efficiency. He further put in valuable work for the expansion of the Imperial Veterinary Research Institute as the Director of the Institute. As a Commissioner he was greatly responsible for advancing the cause of the profession as a whole. Mr. Ware was sometimes known as a strict disciplinarian. He knew for a fact that all this was out of his love for the advancement of the profession and the raising of the status of the veterinarian which by his education and training he fully deserves.

He said he was not going that day to speak in detail regarding the veterinary education in this country or the status of the professional men in India. All these have been said by many people on many occasions at different places. However he referred to the important role a veterinarian has to play regarding the communicable diseases of animals to man, inspection of animal products used for human consumption, thus looking after the health of the human population as well. He suggested that with the expansion of the Imperial Veterinary Research Institute both at her courses and advanced training in animal husbandry as such, diplomas of Associations should be given for specialization in the different branches of veterinary science. No one can master all the branches and specialization in different subjects alone will lead to greater efficiency of the veterinarian in research work. He further said that in the ordinary civic life the veterinarian should have a place for himself in the district and local boards and representative assemblies. In the safe-guarding of health of man and animal in a city or a small village; he should be closely associated in the

day-to-day work with the medical officers of health in taking preventive and curative measure regarding the health of animals especially keeping in view the diseases that are communicable to human beings. He stressed the points that no arrangement would be complete without this close association. These two sister branches of the medical profession together can guarantee satisfactory operations for the purpose, alone, neither can do it completely.

Another point he stressed was in the education of veterinarians in this country. So far sufficient attention has not been paid regarding matters relative to the raising and feeding of fodder crops or the preservation and uses of natural fodders or grasses. This is a matter that should be seriously taken into consideration. He stressed it on his professional colleagues that to render fullest possible service to the livestock owners they must mix freely with them, gain their confidence by real sympathetic work and prove to the livestock owner that he is their sincere well-wisher. With this confidence gained, real service could be rendered to the livestock owner. He should not only know about the prevention and curing of diseases, he must also know fully regarding animal husbandry—breeding, management. For this he should fully fit himself and co-operate with the allied profession of agriculture in telling them his needs and using their knowledge to the best end in raising satisfactory livestock.

He said now a days the use of animals in the army transportation has been greatly replaced by mechanization. This need not dishearten the veterinarian. There are many branches relative to livestock work which were till now not sufficiently looked to but would naturally gain more importance which they deserve.

Livestock raising and poultry raising and other allied subjects should hereafter have expert veterinarians—people who should specialize in these subjects and can speak with authority. This would come out of proper training, experience, and specialization in the particular branch of the science.

He also referred to the great demand for medical men in the present war but very little is heard of any demand for the veterinarians. He wanted the Animal Husbandry Commissioner to please note that veterinarians of the country are fully alive to the events now happening and would place their services at the disposal of Government if need be and would prove themselves worthy of such confidence as to place themselves in any sphere of work for operations in attaining victory over the aggressors who are ruthlessly disturbing the world peace.

On the President's delivering his address and resuming his seat Messrs. Ware and a few others who had urgent engagements at the Cattle

Show and elsewhere had to leave the Conference and Mr. M. S. Sastry, G.B.V.C., a member of the Association and Treasurer and Ex-General Secretary, the All-India Veterinary Association being called upon by the President of the Association, to propose a hearty vote of thanks to Mr. Ware said — “I am commanded by the committee to do the pleasant duty of proposing a hearty vote of thanks to Mr. Ware, who has so kindly responded to our invitation and graced the occasion with his presence. I am thankful to the committee for this concession shown to me, the most recently enrolled member of this association in preference to other older and senior long standing members of it. It may be out of their excessive joy at the return of the son of the soil who had long stayed away from home, the committee have entrusted this pleasant duty to me. Much weightier reason than this lies in the fact that I was a student of Mr. Ware in the Bombay Veterinary College where he commenced his service in India. Later on I worked under him for about eighteen years during his stewardship of the Madras C. V. D. and still later on, as the General Secretary of the All India Veterinary Association, I served him when he presided over the Ninth All India Veterinary Conference at Bombay in 1936. Thus I have known Mr. Ware all these 34 years of his service in India, more intimately than many others in this hall to-day. Whatever may be the reason for my having been selected for this pleasant function, I do it readily and with great pleasure as I may not have another opportunity to pay my humble and respectful tribute to my old and revered teacher, Director and President and I thank the committee for this.

His motto in life may be summarised in the advice given by him to the young men in the conference at Bombay. It runs thus :—“Know your job. Virtue is its own reward.... Be thorough and strive for efficiency.” What he preached in the above advice he has been himself practically observing in life. His students found in him a painstaking, thorough, impressive and ideal teacher who did not proceed an inch further unless he made himself sure that every-one in the class understood and followed him well. He has been strongly of the opinion that the Veterinary graduate in India should receive adequate training in animal medicine, nutrition and genetics to make him converse intelligently in all these subjects which alone will place the Veterinary profession in the forefront of those doing service for the country. He has emphasised this point several times. To-day if we are having the expanded courses of studies, affiliation of the college to the University and the Institution of a B. V. Sc, degree in Madras, they are in no small measure due to the clear and forceful plea put forth in such statements and utterances from men occupying highest positions in the Government. The present laboratory and their fine equipment in the Madras Veterinary College may be easily traced to the efforts of Mr. Ware who has been keenly alive to the necessity of giving adequate scientific training to the Veterinary graduates in this country.

As an administrator, he has rendered invaluable services to the Presidency of Madras where he directed the policy and programme of the C.V.D. with phenomenal success. "From practical nothing, Mr. Ware worked the department to one of the most efficient departments and that C. V. D. in Madras is mainly his creation". "For Mr. Ware, his work is his hobby." His high sense of duty and anxiety to maintain the purity and efficiency of the department at a high level; sometimes he earned for him the name of "Hard-task-master." He was respected and admired more than dreaded on this account by his subordinates. They all knew that he was actuated by a strong desire to improve the efficiency and usefulness of the department and to make it the best in India. He succeeded admirably in this noble effort and in the Presidency itself the C. V. D. earned in his time a very high reputation among the departments of the Government. He has in fact earned a very high regard and admiration from all who came in contact with him at Madras in his time was really considered to have been very fortunate to have such a talented and able administrator.

It was in his time that a Veterinary Association — the present Madras branch of All-India Veterinary Association — came for the first time into existence in that Presidency. Many meetings and conferences were held by the profession. Later on a few of the active workers went round many parts of India to organise the Central Association and Provincial branches. Their efforts were crowned with success. The success attained by the Madras Veterinary Journal founded by Mr. Ware and published under his care, encouraged the members of the profession later on to found the *Indian Veterinary Journal*, the official organ of the All-India Veterinary Association which has been working in the common interests of the profession and the departments in this country, with conspicuous success. Though perhaps Mr. Ware could not see eye to eye with workers in their activities in the Association and its *Journal*, he admirably maintained a spirit of toleration and observed a policy of non-interference which earned for him a much higher regard and respect both from his subordinates and all others who keenly and anxiously watched the situation. He was quite satisfied if his subordinates discharged their official duties efficiently and faithfully whatever may be their extra activities in the associations, meetings and conferences. He never mixed up issues and never punished the subordinates in the department for their activities in the association. He never stretched the meaning of either the Government Servants' Conduct Rules or of the Civil Service Regulations or of Fundamental Rules to the detriment of the men in service. In fact they all received a fair treatment and promotions in due course provided all other things were satisfactory. He was really considered a guardian angel of the interests of his men in this respect. I can quote many solid and substantial instances in support of all that has been said

now of Mr. Ware, but it is unnecessary to enter into such details. Frank Ware is in fact considered as fair-minded Ware.

It now remains for me to mention briefly the tact and ability with which he conducted the proceedings of the All-India Veterinary Conference at Bombay which earned for him the high appreciation of the record number of delegates assembled there from all the parts of India.

His conspicuous success as the Director of The Imperial Veterinary Research Institute, Mukteswar and now as Animal Husbandry Commissioner with the Government of India is so well known to you all and I need not recount them here. His services to India as a whole are as invaluable even as they have been to Madras.

On behalf of you all, I propose with greatest pleasure a hearty vote of thanks to Mr. Ware for his having very kindly opened this conference with a valuable and weighty speech. On your behalf and on my own I wish him long life, health and happiness.

After this Mr. Ware spoke a few words in reply in appreciation of what the previous speakers said of him.

After the departure of Messrs. Ware and a few others from the Conference hall to keep up urgent engagements elsewhere, the Conference resumed its work, and the Secretary Mr. P. U. Nayar read the report on the working of the Association which ran as follows;—

Mr. Ware, Mr. President, Ladies and Gentlemen,

It is with great pleasure that I am now placing this Report of the Managing Committee of the Mysore Veterinary Medical Association for the period from 4—3—1940 to 17—1—1942.

The Managing Committee consists of the following members elected by the General Body at the meeting on 4—3—1940.

President :—S. D. Achar, Esq., G.B.V.C., F.G., (Punjab).

Vice-President :—Dr. P. M. Narayanaswami Naidu B.Sc., L.V.P., SC.D.,
F.F.A.S.

Secretary & Treasurer :—P. U. Nayar, Esq., G.B.V.C., F.G., (Mukteswar).

Members :—*Messrs.* K. Ranganatha Rao, G.M.V.C.,

Subedar T. V. Manikraj, G.B.V.C.,

M. Subba Rao, G.B.V.C.,

K. Srikantiah, G.B.V.C.,

K. J. Subramanyam, G.M.V.C.,

S. K. Sundaram, G.M.V.C.,

Membership.—It is a matter of great satisfaction that the membership has been gradually increasing from year to year. At the commencement of the period, it stood at 133, consisting of one Life-member, 24 Honorary members and 108 Ordinary members. The Donors of buildings to Veterinary Institutions in the State, enrolled as Honorary members as per Resolution of the 10th Annual Conference, continued their membership. 15 Ordinary members newly joined during the period, making a total of 148. Mr. M. S. Sastry, after his retirement from Madras Civil Veterinary Department has enrolled himself as a member of this Association. It is hoped that the lead given by him will be followed by other members of the profession who similarly retire and settle down in the State. I further take this opportunity to appeal, on behalf of the Association, to the members of the profession and to the large number of Livestock owners in the State who have not yet become members of the Association, to come into our fold and to help the Association in its useful service to the Livestock population of every part of the State.

Committee Meetings. :—The Managing Committee of the Association met five times during the period to conduct the routine work and the average attendance at the meeting was 7.

Accounts :—Now I place before you the following Statement of Receipts and Expenditure of the Association for the period ending 17-1-1942.

Receipt.			Expenditure.		
By	Rs.	A. P.	To	Rs.	A. P.
Opening balance at Government Savings Bank.	4	5 8	Closing Balance at Government Savings Bank	4	5 8
Cash at Malleswaram Co-operative Society 10-7-1940.	69	0 8	Cash at Malleswaram Co-operative Society.	73	9 8
Subscriptions received from members from 4-3-1940 to 16-1-42	85	0 0	Managing Committee Meeting expenses.	14	6 0
			Remuneration to Typist-Clerk for the years 1939-40 & 1940-41	30	0 0
			Printing charges of Receipt books.	3	0 0
			Advance to Municipality for buntings, etc., for this year's conference.	15	0 0
			Telegram charges to Hyderabad.	1	9 0
			Printing charges for Invitations.	16	8 0
Total.	158	6 4	Total.	158	6 4

The total collection of the subscriptions from the members is far from satisfactory and is only Rs. 85/-. It is expected that the members will please come forward and pay up their arrears.

It only remains for me now to mention a word in explanation for the delay by a few months in holding this Conference. Thanks to the All-India Cattle Show Committee for having selected this premier city of Bangalore as the venue of the first All-India Southern Regional Cattle Show and I am sure that all the members of this Association will immensely appreciate the action of the Committee in postponing the Conference to a rare and important occasion of this type with a view to afford an opportunity to the members, especially in the distant parts of the State, to see the various breeds of cattle, sheep and poultry which have assembled at the Show now going on in our midst.

P. U. NAYAR,

17-1-1941.

Honorary Secretary & Treasurer.

After some discussion, ensuing the presentation of report on the various points such as the arrears of subscription and steps for the collection, the report was put to vote and adopted unanimously.

Mr. Badami the President of the Conference congratulated the Mysore Veterinary Medical Association on its good work mentioned in welcome address and the Secretary's report and appealed to the members in arrears to clear up their arrears as the subscription to the Association is the first debt of honour which every member should consider a sacred duty to discharge. The Conference was adjourned to meet again next day at 2 P.M. in the same hall.

Second Day (Sunday the 18th January 1942.)

The Conference reassembling at 2 P.M. to-day, took up, by unanimous consent, the suggestion made by the President, Mr. B. K. Badami, and first attended to the business item on the programme, namely, the election of Office-bearers of the managing committee for the year. Messrs. M. S. Sastry, and Jagannathan were appointed tellers.

Mr. S. D. Achar, the Superintendent of Veterinary Services in Mysore continues to be Ex-officio President.

Dr. P. M. Narayanaswami Naidu was re-elected Vice-President, and Mr. P. U. Nayar was re-elected Secretary and Treasurer.

Messrs K. Ranganatha Rao, K. Srikantaiya, M. S. Sastry, T. V. Manikya Raj, K. J. Subramanyam and M. Subba Rao were elected members of the managing committee.

Next item on the programme being the resolutions, the following were duly passed:—

(1) *Expressing deep sorrow at the demise of H. H. Sree Krishna Rajendra Wadayar Bahadur, the late Maharaja of Mysore and respectfully conveying the sympathy to the members of the Royal family.*

(2) *Message of loyalty and congratulations to H. H. Sree Jaya Chamarajendra Wadayar Bahadur on his accession to the Throne of Mysore.*

(3) *Condolence resolution on the sudden and premature death of Principal Panikkar of the Madras Veterinary College and of sympathy with the members of the bereaved family was also passed.*

(4) *Proposed by Mr. P. U. Nayar, in the unavoidable absence of the President of the Association and seconded by Dr. P. M. Narayanaswami Naidu, Mr. M. S. Sastry of the All-India Association, now settled down in Bangalore on his retirement from Madras C. V. D., was unanimously elected an Honorary Member of the Mysore Veterinary Medical Association, in view of the valuable services rendered by him to the Profession in general and to the All-India Veterinary Association in particular and also in founding this Association in Mysore.*

The President Mr. Badami spoke in appreciation of the step taken by the Mysore Association in electing Mr. Sastry as its Honorary member. He also congratulated Mr. Sastry on his election, saying he richly deserved this. Mr. Sastry in his turn thanked the members of the Mysore Veterinary Medical Association for having thus appreciated his humble services and Mr. Badami for his kind reference to him.

Resolutions requesting the Govt. of Mysore to institute "Improvement of Livestock Fund," to nominate Veterinary Officers to the Municipal Councils and District Boards, to entrust the inspection of Hackney carriage animals (ponies and bullocks) to the members of the Veterinary Profession in the Premier city of Bangalore as is done now in other Municipalities of the State and to appoint Stockmen in each of the Hobli Headquarters of the State were also passed.

At this stage the Conference adjourned for Tea and on reassembling after Tea, the following professional papers were read and a keen discussion took place on each of them :—

1. "Fluke Erradication Schemes in the Irwin Canal Area".—By Mr. Krishna Murthy, Dist. Vety. & Live stock Officer, Mandya.
2. "Liver Fluke Disease in the Irwin Canal Area".—By Mr. N. S. Krishna Rao.
3. "Liver Fluke Disease in Sheep and Goats in Marwar".—By Mr. G. N. Srikantiah.
4. "After-Treatment of Distomatosis in Cattle and Sheep subsequent to worming them with Carbon-tetrachloride mixture".—By Mr. C. R. Narayana Rao.
5. "Schistosomiasis in Dog and its Treatment".—By Mr. P. Veda Bhat.
6. "The role of Vitamins in Pregnancy in animals".—By Mr. K. J. Subramanyam.

For want of time the following papers were taken as read :—

7. "Variola with special reference to 'variola ovina'".
8. (a) "A note on Camel Keeping in Rajaputna."
(b) "Evolution of Merino Sheep".
(c) "A short note on *Arnithodorus Savignyi* (Audouin) in Marwar."
(d) "Sheep Husbandry & Wool Trade in Jodhpur State".
(e) "A short note on warble fly pest with a special reference to the pests in deer in Jodhpur State."—By Mr. G. N. Srikantiah.
9. "Nasal granuloma and its treatment with Tartar Emetic—By Mr. K. S. Gopal Rao.

The members who contributed the papers and those who participated in the discussion were duly thanked for making this important item on the programme very interesting and instructive. The President suggested the printing and distributing the professional articles in future among members sufficiently early in advance of the Conference to save the time of reading them and to enable the members to come prepared for discussion.

The President heartily congratulated the Mysore Veterinary Medical Association on their yet another useful and successful session of the Conference, thanked them all for their kind co-operation in making his work as President quite pleasant and easy.

Dr. P. M. N. Naidu proposed a hearty vote of thanks to Dr. Badami for having so successfully conducted the Conference and enhancing its usefulness by his practical and timely suggestions. With three cheers to His Highness the Maharaja of Mysore and to the President of the Conference, the Sessions terminated.

Third Day. (Monday the 19th January 1942.)

The usual Departmental Conference exclusively open only to the members of the Mysore C. V. D. was held at the Office of the Superintendent, Veterinary Services in Mysore, Bangalore from 3 to 5 p.m. and various administrative and departmental matters were discussed under the presidency of the Superintendent who is the ex-officio President of the Association.

Since this Conference had been thoughtfully arranged during the week of the All-India Southern Regional Cattle Show held for the first time in Bangalore, the members attending the Conference visited the Show in the mornings and attended the distribution of Shields, medals and other prizes on the last day of the Show. It is of interest to note here that all the members of the Mysore C. V. D. attending these annual Conferences of the Mysore Veterinary Medical Association are treated to be on duty when attending the Conference, an unique feature which the C. V. D's in other States and Provinces in India may well follow with benefit to the country and profession.—(F. O. S. C.)

GO-SEVA SANGHA, WARDHA

First Conference

The first Conference of the Go-Seva Sangha was held at Wardha on the 1st and 2nd February, 1942. The president elect, Pandit Madan Mohan Malaviya who has honoured the Sangha by becoming its member could not attend due to weak health. Acharya Vinoba Bhave therefore, presided. Distinguished among those who were present were, Mahatma Gandhi, Srimati Kasturba Gandhi, Rajkumari Amritkunwar, Sjt. Mahadeo Desai, Seth Khansyamdas Birla, Shrikrishnadas Jaju, K. Majumdar, J. C. Kumarappa, Shri Pratap Seth, Seth Govindram Seksaria, Sardar Bahadur Sir Datar Singh, Shri Harsha Bahadur Shahi, Director of Veterinary Services, C. P., Seth Surjee Vallabhadas, besides a good number of delegates and workers in the cause of the cow, from different parts of the country, several technical experts also attended by a special invitation.

The proceedings of the Conference opened with Vande Mataram sung by a lady worker of the Mahila Ashram. She was followed by Mahatma Gandhi who delivered his inaugural address in Hindustani. In the course

of his speech he laid stress on the economic basis of the working of the Sangha and pleaded for a scientific attitude and intelligent application of the sentiment of love for the cow. He advocated overhauling of the administration and methods of work prevalent in the numerous Pinjarapoles and Goshalas in the country. Gandhi deplored the increasing adulteration of Milk and Ghee and exhorted workers to work for its prevention and for the supply of pure cow's milk and its products. He said that quarrelling with non-Hindus for the sake of saving the cow was a remedy worse than the disease and held that the cow could only be protected by increasing its economic value, by improving the breed and milk yield in its life time and utilising its bones, hides and other parts of its body after death. He stood for preference of the cow to the buffalo, for he said, it was impossible to save both simultaneously. Answering a question he opined that every congressman irrespective of caste and creed could participate in cow service on those as a part of the constructive programme.

The Secretary Shri Radhakrishna Bajaj then read out the report of the work done so far. In the end Shri Vinobaji delivered his presidential address in Hindustani extempore. He said the service and utility were inter-dependent. "You can serve those useful to you and whom you serve can alone be useful. This is true of the cow too." Vinobaji emphasised the importance of kind treatment, personal attendance and co-operative keeping of the cow and exhorted the members of the Sangha to strictly keep the cow by using exclusively cow's milk and its products as an effective menace of propaganda.

The first day's proceedings came to a close with the passing of the following resolution including the fundamental policy of the Sangha.

Whereas India is an agricultural country, 90 percent of whose population subsist on cultivation of land and whereas Indian agriculture depends solely on bullock power and whereas besides yielding milk and ghee the cow alone supplied bullocks, this Conference is of considered opinion that the improvement of the present condition and economic status of the cow and its progeny is indispensable in any scheme of economic planning of a national basis.

This resolution was moved by Shri Pratap Seth and seconded by Sardar Bahadur Sir Datar Singh.

Second day's proceedings

On 2nd February 1942 three resolutions were adopted, the important two being the following :—

I. Whereas the practices of under-feeding, keeping in insanitary conditions, over-working and rough-handling of cattle and subjecting them

to the tortures of *Ar* and *Phooka* are violation of the humanitarian sentiment and tend to decrease the utility of the animals, this conference appeals for the awakening of public conscience and exhorts the people in general and workers in particular to work for the prevention of such cruelty and take the aid of the law where necessary.

II. The primary object of Pinjarapoles and charitable Goshalas in this country is to save infirm, maimed and diseased cattle from slaughter and physical torture by offering asylum and relief. For the effective fulfilment of this primary object it is necessary now to introduce improvements in the working of these institutions and extend their scope on the following lines :

(1) Every such institution should provide for veterinary aid and other scientific facilities which should be available to the general public.

(2) All infirm and scrub animals should be prevented from multiplying and good care and breeding facilities should be provided for all good cows to enable them to yield better milk and draught males.

(3) Every institution should maintain good breeding bulls whose service should be available to the surrounding population.

(4) Every institution should have as far as possible extensive pastures on which they should maintain dry cattle farms. These farms should accept young stocks of the villagers for rearing on scientific lines till they reach maturity. Good bulls should also be maintained on these dry cattle farms.

(5) Every institution should produce sufficient amount of fodder and store them on their estates in the form of silage etc.

(6) Building constructions, water facilities and other arrangements on these institutions should as far as possible be on uniform models with due regard to health, hygiene and other scientific considerations.

(7) Every institution should maintain an expert to direct and supervise all the working on the scientific side, This expert must possess qualifications in feeding and breeding, of cattle and should also have a working knowledge of fodder cultivation and veterinary science.

With the concluding remarks of the President the conference came to a close. Then followed the general meeting of the ordinary members of the Go Seva Sangha, under the Chairmanship of Shri Jamnalal Bajaj, the President of the Sangha.

The following elections were made.

Shri Vinoba Bhawe : : *Vice-President.*
,, Pratap Seth : : *Treasurer,*
,, Mahabir Prasad Poddar : : *A Trustee,*
Sardar Sir Dater Singh
and Shri Abhaya Deo. : : *Members of the Executive Council.*

Invitation for the next conference was received from Bombay.

On the 3rd and 4th February 1942 joint meetings of committee of experts and the executive council of the Go Seva Sangha were held. Gandhiji attended both days and took part in discussions.

The following recommendations of the committee of experts were adopted:—

1. Reform and affiliations of Pinjarapoles and Goshalas.
2. Improved feeding and rearing of good bulls in selected areas.
3. Organisation of milk industry in villages adjacent to towns and manufacture of ghee in the interior villages.
4. Prevention of undesirable progeny by castration of scrub bulls by humane methods.
5. Increasing supply of fodder by cultivation and other means.
6. Prevention of adulteration of milk products.
7. Opening of Tanneries of dead cow-hides.

Abstracts

Suggested therapy for albuminuria in dairy cows at parturition
BY G. H. FREER AND C. E. HAYDEN. *The Cornell Veterinarian* Vol. XXX
Jan. 1940 No. 1.

A series of eleven obscure cases, records of dairy cows, showing some unusual symptoms, occurring just after or near the time of parturition, not attributable to ketosis, milk fever, parturient haemo-globinemia or poly-nephritis are presented by the authors with the line of treatment adopted (for details the reader is referred to the original) resulting in ten re-coveries.

There were no significant changes in the blood constituents; blood appeared normal though haemoglobin values were not recorded. Calcium and inorganic Phosphorus values in the blood of cow 8 are those usually found in milk fever and it is cited that the case is probably one of milk fever. Creatinine values, in three instances, are slightly higher than usually found in normal cows. Acetone bodies were slightly high in cow 7. Per-

centage of serum proteins in four cases seems to be slightly more than a normal high.

Significant of the urine findings are the albumin in ten of the eleven cases ranging from a trace to .861 grams per 1000 c.c. of urine; and sugar, in six cows examined, showed the excretion varying from a trace to 18 grams per 1000 c.c. Tests revealed them to be dextrose or a mixture of dextrose and lactose.

Urine of cow 6 that died, was acid; in addition to albumin and sugar a few granular casts were observed on microscopic examination.

The outstanding feature observed—albuminuria with glycosuria—appears to have suggested to the authors the addition of protein to the diet, the administration of egg-white and in some of the later cases egg-white in skimmed milk. In most of the cases the treatment was too diverse to support the specificity of protein therapy; but recoveries indicate that added protein could have been helpful.

The need to test for albuminuria as a routine is stressed; the value of examination for the constituents in urine as aid to diagnosis, particularly in obscure cases, based on a knowledge of applied Physiology is impressed.

The Cornell Veterinarian, Vol. XXX, October, 1940, No. 4. BY ROY L. MAYHEW, pp. 495-498.

Observations on the total E. P. G. of faeces were made, when experimental calves were fed increased and reduced amounts of hay, during sickness when the intake fell below normal as also when the quantity of edible hay was reduced in the bier due to being spoiled by the spilling of water. These data are presented and indicate that the amount of hay consumed influences inversely the number of nematode eggs counted per gram of sediment. Eight instances in five calves of increased egg count due to reduction of the amount of hay consumed are reported.

The time required to affect the change in count after the change in amount of hay consumed is usually one to three days according to the data obtained.

These observations would seem to have a very significant meaning from the standpoint of practical veterinary medicine. Any change in food intake (particularly roughage) or changes in activity of the gastro-intestinal tract, physiological or pathological would alter the faeces in kind and quantity so as to dilute or concentrate the number of eggs passed by a given number of parasites. Consequently, without the proper history, considerable caution should be used in making a diagnosis of the degree of parasitism on the basis of egg counts,

Extract

Why Cattle Need Minerals.—By P. VENKATARAMIAH, M. A., B. SC., (Edin.), *Government Agricultural Chemist, Madras.*

Work was started in 1935 at Coimbatore, under a scheme financed by the Imperial Council of Agricultural Research, to study the requirement of calves and cows for calcium and phosphorus. The experimental animals were fed with rations containing known amounts of the minerals, and the quantities excreted were determined; by subtracting the quantities excreted from the quantities fed the quantities retained in the body of the animals were determined. If more was consumed than excreted, the animals were considered to be getting sufficient for their needs, and if the quantity excreted was more than that consumed, the animals were considered as not getting sufficient for their needs. The requirements for a given mineral was estimated by the quantity required to be consumed to just balance the amount excreted.

Chronic Deficiencies.

As a result of this work it was found that a heifer calf from the time it was weaned up to the time it grew up and matured, required about 1 oz. of calcium and 1 oz. of phosphorus daily in its diet to supply its requirements for growth and bone building. When the heifer was pregnant and up to the time the calf was born the requirements for the minerals remained of much the same order; with the onset of lactation in the cow it was found that the requirement for phosphorus remained at about 1 oz. but the requirement of calcium depended on the quantity of milk given. A cow giving about 15 to 20 lb. of milk per day required 2 oz. of calcium per day, and proportionately greater quantities for greater quantities of milk yielded. The requirement for calcium was appreciably higher in the cow in milk than when she was pregnant or when she was a young growing animal. The rations fed during the experimental period were liberal ones providing an ample supply of concentrates consisting of cotton seed, groundnut cake, rice bran, *dal* husk, and green *chulam* or maize fodder or guinea grass or green grass; in addition 1 oz. per day of mineral mixture consisting of bone meal and shell lime were given. This ration was fed on a sliding scale according to the size of the animal. The ration was liberal and provided for sufficiency of all nutrients, *i. e.* proteins, carbohydrates and fats and mineral matter for calves and heifers, but with the cows in heavy milk it was not found to be possible to supply sufficient calcium for their requirements and the animals were always excreting more calcium than what they got in their food. The quantities of phosphorus were usually sufficient. It is plain that a heavy-yielding cow is chronically in a state of deficiency for calcium, even with a liberal ration *plus* a mineral supplement.

Valuable data at Coimbatore.

The experiments at Coimbatore have given data on (i) the requirements of calves, heifers and milking cows which have not been known till now, (ii)

have shown that even with a liberal ration as fed on Government farms, unless the ration contains 1 oz. of mineral mixture, it does not supply sufficient mineral matter to meet the needs of calves and heifers, and (iii) that with the cows yielding 15 to 20 lb. of milk per day, the liberal ration fed with the mineral mixture was not able to supply sufficient calcium to supply their requirements.

No experiments were conducted with working bullocks, but the results obtained at Dacca (Bengal) by I. B. Chatterjee have shown that bullocks on a ration of paddy straw and linseed cake required about the same amount of calcium per day, i. e. 1 oz. and about a quarter of that quantity of phosphorus for their daily requirements.

Analysis of Pastures.

A study was also in progress regarding the mineral content of natural pastures in the province by a pasture survey. Samples of grasses from all parts of the province were obtained and analysed for their chemical composition with special reference to their mineral value. It was seen that while in the greater part of the province, the grasses had a good content of both calcium and phosphorus, those of the Malabar district were poor in both the minerals, the northern part of Salem district had a low calcium content in its grasses, while in Kurnool and parts of the Anantapur Districts the calcium content was good but the phosphorus content was very low. The east coast districts had natural pastures of high nutritive value, and also the Coimbatore district in the south. The area of deficient minerals was therefore the Malabar district, while the North Salem and Kurnool district and parts of Anantapur were areas of imbalance with a good calcium and low phosphorus content.

Deficiency Disease

When these results were studied in connection with the condition of the cattle in the areas, it was seen that in the areas of deficiency, i. e. Malabar district, the cattle are generally short in stature and in poor condition, and that good cows when introduced there rapidly deteriorated in yield of milk and in general condition. This could be explained by the poverty of the pastures in both minerals. In the Kurnool district the cattle, though in general satisfactory in condition, suffered in some talukas from a disease known locally as *Vayu-potlu* or *Vayu-noppulu*, diagnosed as rheumatic arthritis, which results in the animal being crippled by swelling and pain in the limbs, and unable to do any work. This disease affects working bullocks mainly but a few cases occur among cows and fewer among buffaloes. This disease is associated with an imbalance between calcium and phosphorus in the natural pastures of the area; the calcium content is high while the phosphorus content is very low.

Blood studies were conducted at Coimbatore and it was seen that the blood also had an abnormal imbalance of the minerals in it.

The study of the disease was extended to the water supplies of the areas where it occurred in a severe form and results revealed the presence of an element, fluorine, in the well water. Fluorine affects the absorption of phosphorus into the animal body after digestion and its presence probably

aggravates the effects of a poor supply of phosphorus in the food of cattle in the affected areas. Further studies are in progress to find methods for the prevention and cure of the disease along the lines of the use of a mineral mixture to supply sufficient phosphorus lacking in the food and to remove the fluorine in the water of wells in the affected villages by a simple method.

Prevention and cure of Deficiency.

The results of Coimbatore experiments have shown not only the importance of the problem of mineral matter to cattle, but also a way of overcoming deficiencies in its supply. In all experiments described above a mineral supplement was used to balance the supply of calcium and phosphorus to the animals, so that in addition to the calcium and phosphorus they consumed in the rations, additional quantities of the two minerals could be drawn from the mineral supplement fed to the animals. The mineral supplement consisted of equal parts of burnt shell lime and steamed bonemeal ground into a fine powder, mixed in equal proportions. Both shell lime and bonemeal are cheap and easily available in this province. The burning of shell lime and steaming of bonemeal are comparatively simple processes, and as a result the mineral mixture can be had easily and cheaply. Such a mineral mixture is available at about Rs. 6 per cwt. There are many other mineral supplements put up in various forms on the market, but those cannot compete in price with the mineral supplement used at Coimbatore.

By the use of the mineral supplement, animals which are suffering from a gross deficiency of the minerals of any one, or an imbalanced supply of either in relation to the other in their food are enabled to make good the deficiency or imbalance. For cows or calves which are generally undernourished as regards minerals, or for animals living in a mineral deficient area, the mineral supplement will make good the deficiencies and prevent the onset of symptoms of disease caused by the deficiency.

The table below gives approximate quantities to be fed to calves, cows, bullocks and breeding bulls. No information is available for sheep, goats and pigs and hence no recommendations have been made for these animals.

Class of animals.	Quantity of mineral mixture per day	Remarks.
Calves 0-18 months	1 oz.	
Heifers 18-24 months	1 "	Also when pregnant
Cows in milk	2 "	If yielding above 20 lb. per day, an extra $\frac{1}{2}$ oz. per day
Cows dry	2 "	
Bullocks working	1 "	To be increased to $1\frac{1}{2}$ oz. in animals above 1500 lb.
Stud bulls	2 "	

The mineral mixture should be fed mixed with the concentrate ration since it often has a smell which some animals do not relish, though they get used to it in course of time; if fed with concentrates the smell is not, marked.

In the areas known to be deficient in the minerals, *i. e.* Malabar, Kurnool, North Salem and probably Tanjore districts, the quantities recommended above may be doubled to meet deficiencies of the minerals in the natural pastures.

The use of the mineral mixture should be constant. It is no use to feed it for a day or two and then to discontinue its use. Mineral mixture is cheap and in the quantities recommended will not cost more than one pie per day per animal.

"Indian Farming", December, 1941.

End This Menace

During our visit to Moore Market on Sunday morning we inspected the meat sales section. Remembering that Corporation authorities and City Councillors have repeatedly urged the municipalisation of all markets in the city in the interests of the public health, recalling, too, that the Health Officer's annual report each year shows a distressingly high mortality from diarrhoea and dysentery and like diseases, we expected to find that the City authorities took special care to see that this most important, because extremely vulnerable part of the market was kept in an unexceptionable sanitary condition. We were grievously disappointed. The smell was abominable. And the sight distressing. On the floor lay meat intended for human consumption, not offal. The vendors could not avoid trampling upon it as they moved. Though it was obvious that the market authorities had prepared for the coming of critical visitors, the butchers' blocks were dirty, and the counters worse. The construction of the stalls is such that it is doubtful whether they can be kept hygienically clean. There are too many interstices in which corruption and disease bacilli can find lodgement. In one corner of the market there were signs that the Corporation was at long last beginning the construction of a more sanitary type of stall, but obviously progress was very slow.

On leaving the meat market we encountered one who affirmed that he was the market inspector. He assured us repeatedly that in his opinion the market was hygienically clean, and that he was satisfied with its condition. And he added that he had no objection to this opinion being published. Such facile acceptance of palpably unsatisfactory conditions does not contribute to the health of the public of the city, or aid the authorities in their endeavours to improve it. A far less complacent attitude is expected of those entrusted with the enforcement of the city's market by-laws. Admittedly their task is not made easy by the facilities provided by the Corporation for cleaning the market. In the mutton market there is only one small water-tap to serve many stalls. In the circumstances, it is not surprising to find that washing a stall consists in pouring a small chatty of water over its surface and wiping it off with one's hand.

The conditions in this, the premier market of the city, present to the public a grave menace which must be ended. It can be with more

effective supervision by the Health Department, and the enforcement of the health laws. It has been said that the markets of Madras would be kept in better conditions if the housewives did their own marketing. That is true. No housewife would tolerate the conditions we saw on Sunday morning. They would demand, insistently and persistently, that they be improved, and that food presented for their consumption be adequately protected from contamination. Their apathy encourages indifference in the responsible authorities. It should, therefore, be abandoned, and in the interests of those they love, housewives should make a point of going to the markets whence their food is obtained at least once weekly. Unless they do, improvements are unlikely.

The Madras Mail, 4-2-1942.

Reviews

A Further Survey of Some Important Breeds of Cattle And Buffaloes in India. By F. WARE, C.I.E., F.R.C.V.S., F.N.I., I.V.S., *Animal Husbandry Commissioner with the Government of India*. Price Re. 1/4 - or 2s.

This bulletin is a supplement to the previous bulletins on the subject which is a valuable addition to the literature on the breeds of Cattle and Buffaloes in our country. It is gratifying to note that the Alambadi and Bargur breeds have found a place in this bulletin—we think it was a serious omission in the previous classifications. Bargur though not very well known outside the tract, still is a very good type of animal having its own special features. We are sure there may be some more types of animals which could have a separate entity and classified as a distinct breed. An example of them is the type of animals seen near Madura and Manaparai in South India. The principle to be borne in mind in classifying these animals as has been outlined in the introduction is the ability to breed true to type over successive generations. Judged by this principle, we expect some “elevation” and “removals” from the list of breeds of cattle on further studies.

The get-up of the bulletin as is usual with the I. C. A. R. publications leaves nothing to be desired.

Review of Veterinary work in Travancore — 1939-40.

Veterinary work in Travancore is included in the administration report of the Department of Agriculture, the Director being the supreme head who is assisted by an Indian Veterinary Graduate as his technical adviser with the designation of “Superintendent.” The duty of the latter officer is to check the work of other officers employed in out-stations by routine inspection. The number of institutions, according to the report, is 15 Government and 8 grant-in-aid, but it is not clear from the report the number of officers employed in the above 23 institutions and their respective qualifications.

It is interesting to report that, as a result of the recommendations of the Board of Agriculture and Animal Husbandry in New Delhi, 15 so called stock men trained locally for 8 months, have been engaged by the Department to treat ordinary ailments of cattle, to perform castrations and to

instruct the villagers on the proper feeding and housing of cattle. The chief reason advocated to engage such men is on account of the impracticability of appointing sufficiently qualified Veterinary officers in large numbers to deal with cattle diseases and problems of livestock improvement. Under this new scheme — perhaps to carry out the same work — United Provinces and Orissa have also followed suit. If the authorities concerned whether in Travancore or New Delhi or any part of India, are sufficiently satisfied that these ill-equipped and inadequately trained men are capable of tackling the animal husbandry problem of India, it would be far better and more economical to engage such men in place of Qualified Veterinary Graduates in course of time and close all the Veterinary colleges in India. To my mind it appears that this policy of entrusting a very important work to a few imperfectly qualified men is not in the interest of the agricultural community and the dignity of the veterinary profession. I must express with all power in my command that it is a 'Penny wise and pound foolish policy'. In a country like India where the existing 5 Veterinary colleges can turn out a number of men and who are ready to accept even the lowest salary on account of the economic difficulty and unemployment the policy of appointing stock men is absolutely unsound. Such posts do exist in Ceylon, Malaya and African Colonies where there is some sense in appointing such men because of the higher and more attractive salaries offered to qualified Veterinarians. The vicious caste system in the Veterinary profession is again introduced as in olden days when there was a system of training of salutaries for sub-ordinate jobs. Of course they were better qualified men on account of their 2 years training. Unfortunately all of our associations—both provincial and all Indian—are not in working condition to express our protests of the policy adopted by the Imperial Council of Agriculture and Animal husbandry.

Disease investigation and control :—It is mentioned in the report that a vaccine for black-quarter has been used to protect 1250 cattle and which afforded a better and longer immunity. It would have been more interesting for an outside reader if it had contained a detailed information of the dose and period of immunity obtained in a tabulated form. The problem of sterility and trematode infection of cattle is another interesting work carried out, but the report is imperfect without any mention being made of the drug used, and the nature of the experiment conducted. So also in the case of contagious diseases, no mention is being made regarding the number of animals affected, died, cured and the methods adopted to bring them under control.

All these investigations, it is said in the report, were conducted by an enthusiastic member of the staff who is peculiarly designated as 'Technical Assistant' a designation not usually heard of in any other veterinary departments in India or outside. The designation as laboratory Assistant or Laboratory Veterinary Inspector would have been more appropriate as in other places.

Grant-in-aid system :—The system of conferring grants to deserving and qualified people for the treatment of animals is a sound policy as it will surely remove un-employment and find an independent living for Veterinary graduates. Travancore, I understand, leads in the system of conferring grants unlike other parts of India. But the system of offering grants to uneducated Ayurvedic medicinal men should be condemned. The report

does not show clearly the qualification of the Grant holders and the nature of their work.

Animal Husbandry :—This work is under the dual control of Agricultural and Veterinary officers and mainly consists of maintenance of stud bulls in different localities owned by private individuals on grant-in-aid system, co-operative societies, rural centres and other associations. Judging from my own observation the progress of this section is rather slow due perhaps to lack of interest and financial difficulties on the part of the cattle owners. It is an herculian task in a country like Travancore to bring this industry in level with more advanced countries.

At present the veterinary section is not an independent department and as such it receives only a step motherly treatment which when combined with the absence of an highly experienced and qualified head, hinders considerably the progress of real scientific veterinary work.

On the whole the report presents a fairly good information but only lacking in details.

M. V. P.

News

A. R. P. for Animals in Madras.

A Committee has been appointed by the Government of Madras for carrying out Air Raid Precautions for Animals in the City of Madras. The Secretary of the Committee is Rao Sahib K. Kylasamier, G.B.V.C., President of the All-India Veterinary Association, Madras-Branch.

The headquarters of this A.R.P., is at the Madras Veterinary College, Vepery. It is proposed to divide Madras into a number of divisions—about 20 which will act as First Aid Posts. The existing Veterinary staff of the Government and Corporation is being utilised for this purpose and they will be helped by the co-ordinated efforts of the Sanitary staff of the Corporation. A Motor Ambulance Van also is being got ready and it is expected the whole scheme will be in working order very shortly.

A. R. P. for Animals in Mysore State.

Mr. G. N. SRIKANTAIYA, G.M.V.C., Veterinary Surgeon of the Mysore Serum Institute, Bangalore, till recently Veterinary Investigation Officer in Jodhpur State, has been deputed by the Government of Mysore to undergo a course of training in A. R. P. for Animals in Bombay. The course is one of three weeks. He left Bangalore this morning for Bombay. On his return from Bombay after completion of his training, his services are expected to be utilised for giving similar training to the Veterinarians and others in the Province of Mysore. The Government of Mysore and Mr. Srikantaiya both deserve to be congratulated on this timely and necessary step taken by them.

In case of any unfortunate emergency, it is proposed, we understand, that the Veterinary Hospitals in Bangalore City, Mysore, Bhadravati, Kolar Gold Fields and the S. P. K. A. Infirmary in Malleswaram, Bangalore, will be converted into base hospitals in A. R. P. for Animals.



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